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EDITORIAL.

Animal Husbandry in Malaya.

The appearance of an article in this issue of *The Malayan Agricultural Journal* on the Friesian Holstein breed of cattle offers an opportunity for some comments on the general position of animal husbandry in Malaya.

One of the outstanding weaknesses of the economic position in this country is the extent to which it is dependent on imported food; this applies not only to staples such as rice, but also to animal products. To illustrate this, it may be pointed out that the nett imports of condensed and sterilised milk amounted in 1929 to 1,334,396 cases valued at $14,108,144, those of butter amounted to 15,659 cwts. valued at $1,172,144, those of dead meat amounted to 2,761 tons valued at $2,024,563, whilst the imports of live animals amounted to 345,999 head valued at $11,110,856. The total value of imports under all these heads amounted to $28,415,677. The figures in this respect are steadily rising and during the past five years have increased by $6,750,000.

Compared with neighbouring countries the total is enormous. For example, in Ceylon in the year 1925 the combined value of imports of dairy produce, tinned and frozen milk, butter, cheese, dripping and lard amounted only to Rs. 2,320,850, whilst the combined imports of cattle, sheep, goats and buffaloes amounted to 90,973 head only.

The dependence of the country on importations of animal produce in this way is a serious source of weakness, while natural conditions supply no reason why the existing state of affairs should be such as it is. The position is almost certainly the outcome of the rapidity with which development has taken place which has led to attention being concentrated on the production of highly profitable export products to the almost total neglect of products of animal husbandry; but while such a state of affairs is natural and comprehensible during periods of rapid development, it is extremely unsound as a general economic proposition, and serious attention to measures which can be adopted for its alleviation seems to be needed.

No doubt it is a matter of difficulty to change the view of a population of which the vast majority have become habituated to the existing state of affairs, but nevertheless this does not alter the fact that the present position is abnormal

and dangerous and that with the continuation of lower prices for exports it is liable to lead to considerable distress and difficulties.

In this connection, milk supplies stand out prominently as a subject calling for attention. The actual milk production in the Peninsula compared with the consumption is infinitisimal, but where dairy enterprises have been carried on, sufficient data have been accumulated to show that conditions in Malaya present no radical differences from those encountered, for instance, in Ceylon, Java or Sumatra where dairying is practised on a comparatively extensive scale. In considering steps for the development of dairying in Malaya, it is desirable that the country should profit, so far as possible, from the experience obtained in other places. Attention may be called to the outstanding results which have been obtained under tropical conditions with Friesian cattle, both as pure strains and more particularly as crosses with native cows. The experience obtained in a number of tropical countries indicates quite clearly the satisfactory nature of the results which have been obtained practically everywhere this breed has been tried.

Furthermore, one may point to the abnormally high prices which at present prevail in Malaya for fresh milk. Ordinarily 40 to 60 cents of a dollar are charged per quart of fresh cow's milk. Compared with standards in other countries this is extremely high; thus in Mauritius it was found that the Government dairy milk equal in quality to grade 'A' milk in England could be produced at a cost equivalent to 20 cents (Straits) per quart, whilst at the Government Dairy in Ceylon milk is sold at a price equivalent to 40 cents per quart.

While admitting that the cost of living in Malaya probably entails that retail prices for milk should tend to be higher than elsewhere, the discrepancy between these figures and prices charged elsewhere is so great that one cannot avoid the conclusion that if operations were conducted on a proper scale, tropical milk production could be undertaken at a very much lower figure than that which prevails at present.

One of the difficulties in relation to the production of milk in the tropics has been that of the conditions under which native cow keepers house their animals and produce milk. The native cow house is usually badly constructed and the conditions are insanitary. In Malaya, sanitary requirements have attained a considerably higher standard in certain respects than in some of the adjoining countries and it is possible that this may partly account for the failure of milk supply to extend up to the present.

The existence, however, of such conditions paves the way for the introduction of better standards once dairying becomes more generalised and in this connection, allusion may be made to the very interesting system of providing a central milking place under official supervision for cows kept by Tamil labourers attached to the Sanitary Board at Ipoh. It is hoped at a later date to publish an account of this in the *Malayan Agricultural Journal*.

Another difficulty which at present lies in the way of increasing dairying is the provision of suitable areas of pasturage. As against this must be set the

fact that large areas of abandoned mining lands exist which at present, except where they have been taken over and converted into Chinese market gardens, are arid and unprofitable wastes. It seems worthy of consideration whether some means might not be found for utilising some of these lands for conversion into pasture.

The Department of Agriculture, during the past three years, has been experimenting at Serdang with the production of milk. The recently approved proposal for the establishment of a small modern dairy for supplying milk to the hill station at Fraser's Hill is also an interesting move in the same direction. The need would appear to be, however, for more concerted action on a larger scale with a view to solving this urgent though difficult problem of replacing the present large import of cattle and dairy produce by local production.

Cinema Films and Agricultural Propaganda. The decision of the Federated Malay States Government to give effect to certain recommendations which were put forward as the result of the Agricultural Field Officers' Conference held in October last relative to the organisation of a Propaganda Van, which will tour the country for the purpose of exhibiting propaganda and instructional films, displaying suitably organised exhibits and providing for the delivery of short lectures on suitable subjects to native agriculturists, marks an important step in advance. The scheme has now been fully worked out and the necessary funds provided for the preparation of films, for the organisation of the van and exhibits and for the operation of the undertaking.

The scheme is being operated jointly by the Department of Agriculture, the Department of Co-operation and the Rubber Research Institute of Malaya. Its inception was due in the first instance to the preparation of two propaganda films by officers of the Co-operative Department which were intended to inculcate by means of simple stories the principles and objects of co-operation. The success achieved in this preliminary experiment led to the formulation of the larger plan which it is anticipated will be in working order in the course of the next two or three months.

The scheme is administered by a small committee consisting of the Directors of Agriculture and of Co-operation and the Director of the Rubber Research Institute, of which the Director of Co-operation is Chairman, while Departmental Sub-Committees have been formed for the purpose of dealing with the details of the work contributed by each Department to the joint undertaking. Similar travelling exhibits have already attained considerable popularity in other countries. In India, the Department of Agriculture of the Madras Presidency has organised a van of this description and satisfactory results are reported to have followed its inauguration. It is hoped that the new venture may in due course prove its value in Malaya. It is proposed to publish an account of the equipment of the van in a subsequent issue of this journal.

Oil Palms. The present position of the oil palm industry is reviewed on another page of this number. The figures shew that the growth of the industry has been slow but steady while there is evidence of a policy on estates of further development for some years to come. Local production of palm oil and palm kernels will increase more rapidly than hitherto as large areas are about to come into bearing, while much of the area already in bearing has not yet reached the stage of maximum production.

In the Netherlands East Indies, the cultivation of the oil palm has been taken up more extensively than in Malaya. While we can only claim 32,000 acres planted, we believe that the neighbouring Dutch Colony has planted an area of over 125,000 acres. Furthermore, their exports now exceed 30,000 tons annually and are still rapidly increasing.

The present state of the plantation oil palm industry and the developments which appear likely, indicate that the time is not far distant when this product will exercise a considerable influence on the oil markets.

Original Articles.

FRIESIAN CATTLE

With some Records of their History in the Tropics.

BY

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The origin of Friesian cattle is obscure, but apparently herds were in existence in north-west Europe at the time of the Roman Conquest. The Province of Friesland in north-west Holland is the home of this breed, and is probably the source of the stock that has been distributed throughout the world during recent times.

Friesians are almost always black and white in colour. The mature stock attain to a large size, the bulls at maturity often scaling over one ton in weight. It is essentially a dairy breed, the cows producing a large quantity of milk. Friesian cattle have gained the reputation of being the premier milk-producing breed in the world. These cattle have also the reputation of being amongst the most economical producers of milk and of total solids contained in the milk and in experiments in Wisconsin, in competition with other breeds, their production has been higher for the amount of food consumed than that of Jerseys and Guernseys. Moreover, they are noted for their ability to consume and turn into milk large quantities of rough fodder and bulky food.

Criticism of this breed in the past has been that the percentage of butter fat often fell below legal standards, necessitating the keeping of a few Channel Island cows in the herd in order to maintain the percentage of fat in the bulked milk up to the standard required by law. The modern tendency in Friesland is to breed cattle that yield a fairly large quantity—but not a phenominal quantity—of milk, with a percentage of fat between $3\frac{1}{2}$ and 4.

A further criticism of Friesian cattle is directed to their liability to tuberculosis. The several Friesian Cattle Associations in Holland and Germany, whose object it is to control and improve the breed, have realised this weakness, and a rigid tuberculin test is carried out by most Friesian Societies to exclude from the herd books the registration of diseased animals. Much care and attention has also been given towards the improvement of the general health of the animals.

There are several associations in Holland and North Germany that control the breeding of Friesian types of cattle. These breeding societies have each

their ideal type of animal, which it is their aim to perfect. Some variations from the Friesian cattle of Holland are being developed by such societies, as they maintain that the breed should be described as a dairy-general purpose animal on account of the fact that the animals fatten readily and the calves are economical to feed for the production of veal.

Cattle from Holland have been imported into England for the past two centuries and it is recorded that Friesland cattle were used to cross with the native British cattle in the establishment of the Shorthorn breed.

The British Friesian Cattle Society, which was founded in 1909, has done much towards the improvement of the breed in Britain, especially in the direction of uniformity of type and general advancement in productivity. One herd of cattle has produced fifteen 2,000 gallon cows, five of which repeated their yields for two consecutive years, while three cows gave 2,000 gallons or more for three successive periods of 365 days. In 1924 this herd of cows averaged 1,530 gallons per cow.

The breeding of Friesian cattle in Britain for the export trade of pedigree stock has, since 1922, been seriously affected by outbreaks of Foot and Mouth disease. Since that date, however, strict quarantine conditions have been instituted which ensure the export of only healthy animals.

It is said (1) that the Holstein Friesians represent almost 60 per cent. of the better dairy stock in America, they are rapidly increasing in numbers in Britain and Australia, whilst in South Africa they have in addition to their intrinsic merits, their country of origin to influence their popularity. They have been tried with success in the West Indies, Mauritius, Hong Kong, India, Java, and Ceylon. Friesian cattle hold most of the world's records for milk production, and even though the percentage of butter fat in their milk is low, they often hold the records for butter fat production because of their heavy milk yields.

Friesian Cattle in South Africa.

In South Africa, the Friesian breed—which was introduced by the Dutch many years ago—has become very firmly established and constitutes by far the most important breed of milch cattle in the Union. It is extensively bred both in the Cape Province, the elevated regions of the central plateau and in the sub-tropical coastal regions of Natal.

The breeding of this strain has been controlled on systematic lines for many years and the South African Friesian Association maintains both individual and herd registers for pedigree animals and herds bred in the Union.

The South African strain of Friesian is well known throughout the world and probably constitutes the most outstanding example of the acclimatisation of a European dairy breed under sub-tropical conditions.

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(1) E. J. Cooper, Holstein-Friesian Association of America.

Friesian Cattle in Australia.

Every year sees the Friesian breed of cattle becoming more widely distributed throughout Australia. In the sub-tropical conditions of Queensland there are over one hundred recognised Friesian breeders.

It must be appreciated that the production and export of butter principally supports the dairying industry of Australia and for this reason both in that country and in New Zealand, the policy of cattle breeders has been to increase the fat content whilst at the same time maintaining and improving the yield of milk.

The Friesian holds the records for butter fat as well as for milk production at least in Victoria, which is the premier dairying State of Australia. In view of the Friesian reputation regarding poorness of milk compared with other breeds, these are remarkable records.

Friesian Cattle in Mauritius.

A Government dairy of over 50 cows was established in Mauritius in 1924 by the importation of specially selected high grade Friesians from South Africa. This dairy was started (2) for educational and demonstrational purposes, and to undertake commercial dairying to supply milk to hospitals, Government institutions and private individuals. The site of the farm was selected at an altitude 1,900 feet above sea-level at Curepipe Camp, where a suitable area of pasturage was available. Mauritius lies approximately on 20 degrees of latitude South. The rainfall is about 110 inches per annum, the mean maximum temperature is 73.9°F., and the mean minimum 61.2°F.

The cattle were housed in substantial stone houses with up-to-date fittings, such as iron stanchions and automatic water supply to each animal.

The main average lactation period was found to be 341 days, whilst the average yield per cow was 2,404 litres (528 gallons), the maximum recorded was 5,200 litres (1143 gallons). The results demonstrated that the Friesian breed is well adapted to the conditions at Curepipe in Mauritius. The establishment of this dairy was a complete success, and at the time the reports were written from which these notes are taken, it was proposed to increase the number of milking cows to 100 head. In contrast, it was found previously that Jerseys were liable to pneumonia, apparently owing to the high atmospheric humidity.

Friesian Cattle in Ceylon.

The following extract is taken from a paper (3) by a dairy farmer in Ceylon whose farm is situated at Kurunegala about 500 feet above sea-level, and is

(2) The Milk Supply of Mauritius :—(a) H. A. Tempany, D.Sc. (b) N. Craig, M.Sc. (c) Y. Lefebure.

(3) Dairy Farming and Breeding of Stock in the Kurunegala District, Ceylon ; M. A. Fernando, M.A. (Cantab). Tropical Agriculturist, Vol. LXX, page 363.

approximately in latitude 7° North. The average humidity is about 78 per cent., the mean temperature is approximately 81°F. with practically no monthly variation, the rainfall being about 70 to 75 inches per annum.

"Importation of British Friesian pedigree bulls for stud have taken place since 1921. The stock bred during the past seven years from these Friesian sires are thriving wonderfully and, as for hardiness, the Friesian half-breds and three-quarter breds are not behind the ordinary village cattle of the district."

"This is a great point in favour of the Friesian breed. Cross-bred Jersey and Ayrshire cattle are if anything rather delicate when reared in the low-country. The half-bred Friesian cows now in milk are much superior to their dams, not only in the yields they give but in the duration of the lactation period. I have not had the opportunity yet to test the milk yields of any of my three-quarter bred Friesian heifers, as the oldest of the second generation heifers have yet to calve. I am confident that these will easily eclipse their dams as milkers. The success so far attained points clearly to the fact that in four or five generations, a grade of cows can be bred which approximate closely to the pure-bred Friesian. These results have been obtained by systematic grading of my milking herds, that is to say, all unthrifty, aged, and comparatively poor milking animals are weeded out annually."

"Another problem that has to be faced in Ceylon when one goes in for cross breeding is the utilisation of the bull calves so bred. Fattening for the butcher is out of the question as the local price of beef will not leave the fattener or grazier with any margin of profit. I use the great majority of my cross-bred bulls for draught purposes and I find that they make excellent cart bulls. They certainly draw a bigger load than the ordinary Sinhalese cart bull and I find they are just as hardy even in the low-country. It is in this respect that I found the cross-bred Jersey and Ayrshire bulls failed. They seem to feel the heat in the low-country while on the open road, and the type of animal is not suited for drawing big loads, as invariably their backs are wedge-shaped and poor in muscle. The cross-bred Friesian bulls can be put to the cart at three years of age, whereas Indian bulls cannot be trained until they are at least four years old."

Friesian Cattle in India.

The following paragraphs are extracts from an article (4) entitled "Cross-breeding and Grading of Cattle in India" at Allahabad. Allahabad is situated in the Central Province at a latitude of approximately 25° North.

"It may be said that the Holstein-Friesian is better than the Holstein-Ayrshire."

"$\frac{3}{4}$ Friesian has proved to be better than $\frac{1}{2}$ Friesian."

"$\frac{7}{8}$ Friesian has proved to be animals of good constitution and good milkers."

(4) K. W. Forman, Animal Husbandry and Dairying in India. Vol 1, page 108.

JAVA-BRED FRIESIAN BULL.

Java-bred Friesian Cow.

"Friesian-Hariana half-bred and grades average 10,000—15,000 lbs. milk. Ayrshire-Sahiwal half breds and grades average 3,000 to 9,000 lbs. of milk."

"Friesian-Sahiwal half-breeds and grades average 8,000 to 10,000 lbs. milk, Ayrshire Sahiwal half breds and grades average 3,000 to 9,000 lbs. of milk."

"Many instances go to prove that the Friesian is superior to the Ayrshire in crossing and grading up with the Indian breeds."

"Half-bred Friesian bulls have been successful in grading up their progeny when mated with Indian cattle."

"A very interesting experiment of crossing half-bred cows to country bulls showed that the progeny were poor milkers, but when country cows were crossed with half-bred Friesian bulls the progeny turned out to be good milkers. This seems to indicate that the sires in both cases were more prepotent than the dams, in spite of the fact that in the second case the sire was a half-bred Friesian. When $\frac{1}{4}$ European cows (Friesian or Ayrshire) were crossed with country bulls, the results were poor, giving a $\frac{1}{8}$ cross averaging 6 lbs. daily. When the same cows were crossed with a $\frac{1}{4}$ Friesian bull, the results were good, when crossed with pure Friesian bulls it gave $\frac{5}{8}$ crossed averaging 28 lbs. daily. The $\frac{1}{4}$ Friesian bull had to have a half-bred Friesian bull as a sire. He could not be the descendant of a country sire and a half-bred Friesian dam in order to make any improvement. This all goes to prove that if one knows the breeding of his Friesian bulls, even if they are not pure-bred, he can get fairly good results. Of course it is always safer to use the pure-bred animal. If, however, the Holstein-Friesian proves to be worth while for grading purposes, it would be better for a beginner to start with a grade-bull and then to follow up with a pure-bred Friesian bull rather than delay until he can afford to buy a pure-bred Friesian bull."

Friesian Cattle in Hong Kong.

The following few notes are observations of the Manager of the Dairy Farm, Ice and Cold Storage Co., Ltd., Hong Kong. This farm is situated at an altitude of about 600 feet above sea-level. The latitude is approximately 22° North.

The mean summer temperature is said to be about 82°F. and the mean winter temperature about 60°F.

The humidity is high, the rainfall being about 84 inches and is seasonal, the bulk of it falling between May and September.

The breeds of cattle found most suitable are pure-bred Ayrshire and pure-bred Holstein and crosses between the two both ways.

The Holstein-Ayrshire is the better cross, the Ayrshire-Holstein produces quite a good grade cow.

Pure-bred Shorthorns have been tried and found to be unsatisfactory.

Friesians in the Dutch East Indies.

The Director of Agriculture, Industry and Commerce, Buitenzorg, Java, in a recent communication makes some interesting observations regarding the Friesian in the Dutch East Indies. The following are the main points in his letter.

Full-bred Friesian cattle are seldom reared in the Netherlands East Indies. A number of farms in Java, mainly situated in the mountainous districts of the Preanger Regencies (West Java) and in North Banjoemas (Central Java) have for many years past been occupied in crossing the original stock with bulls imported from Holland. In addition, a few of these farms have, for the past twenty years, been importing a small number of full-bred Friesian cows and heifers with the intention of rearing their own male breeders.

Many of these farms are of considerable size. For instance, two farms near Bandeong (West Java) each have herds of over 600 head. One farm near Poerwokerti (Central Java) with over 200 head of cattle, possesses an excellent quality of fairly uniform milk-yielding stock of preponderant Friesian blood. The average milk production is about 15 to 20 litres per day. All these farms are situated at an altitude of about 700 to 1,300 metres (2,300 feet to 4,266 feet).

Full grown animals, and generally also the calves, are kept to the cow-sheds owing to the danger of blood diseases, such as anaplasmosis, piroplasmosis and surra. In a few farms, however, it is the practice to allow the calves and young cattle a few hours of liberty in the field.

The farms deliver considerable quantities of milk to the large cities, such as Bandoeng, Batavia, Semarang, Sourabaya, etc., yet without being able entirely to satisfy the existing demand. This is generally due to the lack of cooling-plants, refrigerator cars, and easy rapid communication from the farms to the cities.

In consequence of this transport difficulty, a large number of smaller enterprises have become established in the vicinity of the cities and now take an active part in milk production and distribution. The small farms are generally situated in the warm plains. They rarely breed their own cows, but purchase them from the larger farms on the hills or elsewhere. As a rule they are of poorer quality than the stock owned by the large farms.

The cattle of these farms, however, generally are situated in the warm plains. From the year 1914 onwards Government has made an effort to improve conditions by procuring on easy terms for the use of the smaller and less favourably situated farms, bulls kept for covering (high bred animals which resulted from cross-breeding, of next to pure Friesian blood) originating from mountain farms. During the past 10 years, about fifty such stud bulls have been distributed annually.

In Java, and more so in the other Islands of the Archipelago, the consumption of fresh milk is very small. The native population abstains from drinking

JAVA-BRED FRIESIAN BULLS.

milk as a rule, while a large portion of the European population often prefers the imported canned milk to fresh milk.

Dependent upon the existing competition, the price of milk varies considerably, viz. from f.o. 15 to f.o. 0.30 bottle containing 750 grams or $\frac{3}{4}$ Litre (one Litre = $1\frac{3}{4}$ pints).

Finally, the fact should be stressed that a large percentage of the cattle in the Netherlands East Indies consists of valuable stock of Dutch-Native cross breeds.

Friesian Cattle in the West Indies.

In reports from Trinidad 1929, (5) it is stated that in 1923 Friesian cattle were definitely selected for grading up dairy stock at the Trinidad Government Farm. Trinidad is between the 10° and 11° latitude North.

" The Friesian was selected because of the excellent results obtained from the half-bred Friesians, the result of the breeding of an imported pure-bred Friesian bull. Another reason was that the well-marked dairy characteristics of the Friesian showed themselves in a remarkable way when grading up cattle with a high percentage of Zebu blood.

" Friesians in addition are easy to handle and are very docile, while in the case of the half-breeds the calves can easily be removed at birth and hand reared.

" Since then a system of grading up has been adopted, the stage has been reached where the three-quarter bred Friesian are now in milk and the results show that an improvement has been achieved in each stage upwards. The work, however, is not confined solely to grading up, as animals of the same grade are bred together.

" The following grades exist at present in the herd, viz. half-breeds obtained by a pure-bred sire, half-bred the progeny or half-bred parents, and three-quarter bred the progeny of number one, and number two, with a pure-bred sire. It is hoped this year to breed together selected three-quarter bred.

" It has really been wonderful to see what a marked improvement in the dairy qualities of a cow even a half-bred Friesian bull can impart. For a number of years both at the farm and at the public pastures half-bred Friesian bulls have been standing for service and this progeny, cattle with 25 per cent Friesian blood have been a marked improvement on the ordinary native dairy cow."

Friesian Cattle in Malaya.

Malaya is situated approximately 1 to 7 degrees north of the Equator. The average annual rainfall at the Government Experimental Plantation, Serdang in Selangor where the Friesian and other stock are kept, is 93 inches, the mean

(5) Dairying in the Tropics. H. V. M. Metiver, O.B.E., B.Sc., M.R.C.V.S., Tropical Agriculture, Vol. VI, page 3.

maximum temperature 91°F. and the minimum mean temperature 72°F. The Plantation is about 160 feet above sea level, and 3° north of the Equator.

Two young Friesian bulls were imported by the Federated Malay States Government towards the end of 1929. They are stationed at the Government Experimental Plantation, Serdang, and up to date they have been healthy and are doing well.

These bulls were imported from Hong Kong and are a mixture of Canadian and Holland blood of high milking strains. They are being used to cross with the Sahiwal or Montgomery breed of Indian cows on the Plantation.

It is proposed in the near future to import Friesian incalf heifers from Australia for trial at the Government Experimental Plantation, Serdang and at Fraser's Hill, Pahang.

Summary.

Friesian cattle have justly achieved a reputation throughout the world for their very high milk production and ability to thrive on rough fodder and bulky food.

The modern tendency in Friesian cattle breeding is to improve the fat content of the milk rather than further to increase the yield of milk. Further, many Friesian Societies work for a Friesian which is for dairy-general purposes.

An account is given of the use of Friesian cattle in the tropics. It is shewn that while this breed generally adapts itself to tropical conditions—at least as well as most European pure-bred cattle—the chief value of the Friesian breed in the tropics is in the up-grading of native dairy cattle. The maintenance of herds of pure Friesian in the tropics is usually confined to hill stations, where the climate more closely approximates to that of the temperate zone; while Friesian crossed with native breeds usually prove eminently suitable to the tropical lowlands.

The success attending the introduction of Friesian cattle into many tropical countries accounts for the decision to establish this breed at the Government Stock Farm in Malaya.

The illustrations of Friesian cattle are reproduced from photographs kindly supplied by the Director of Agriculture, Industry and Commerce, Buitenzorg, Java.

AN ATTEMPT TO CONTROL PADI BORERS

BY

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The insects which attack padi are numerous, but it is believed that the most important for certain areas are moths whose larvae bore inside the stems of the padi plant. The depredations of these insects have been the subject of investigations by the writers in Selangor, Perak, Province Wellesley and Penang Island, and it would appear that the damage caused by them is a limiting factor in padi cultivation.

These insects, known as stem borers, may be considered for general purposes to be of three species, but there are others of similar habits and presumably subject to the same means of control which are less common, and which have not yet been identified.

The three insects, control of which forms the subject of this article, are as follows:—*Diatraea auricilia* Dudg., *Schoenobins incertellus* Walk., and *Sesamia inferens* Walk., and it will be as well before proceeding to describe the control measures, to give a brief description of each, and an outline of their habits, for on this last the control measure discussed is based.

Diatraea auricilia Dudg. The male of this moth is a small insect with ochreous brown forewings having a raised spot of silvery scales in the middle and a row of silvery dots along the outer margin. The whole of the forewing is powdered and streaked with darker brown. The hindwings are brownish white. The female is a larger and paler insect and has the silver spots less prominent.

Expanse. Male 18 mm. female 25-27 mm.

The eggs, which are laid on the leaves of the padi plant, are glistening white when just deposited, but turn black just before hatching. Hatching occurs in about four days, and the young caterpillars usually bore into the stem at a node, frequently ringing the plant at this point, so that it snaps off. After three or four weeks the caterpillar pupates, usually inside the stem, but sometimes among the leaf-sheaths at the base of the plant, and in about ten days the moth emerges.

Schoenobins incertellus Walk. Both sexes of this moth are pale ochreous, rather darker round the outer margin of the forewing and having a black discal spot on each of these wings. The hindwings are whitish.

Expanse male 18-22 mm. Female 32-34 mm.

The habits are very similar to those of *Diatraea*, but the egg masses are covered with a felting of scales from the body of the female. The caterpillar too, is very different in appearance.

Pupation always takes place inside the stem and the pupa is enclosed in a cocoon of white silk, which has a silken tube running from it to a previously prepared exit hole. The whole life cycle lasts 4—5 weeks.

Sesamia inferens Walk. Forewings pale fawn coloured with a few scattered black dots near the middle. A dark brown stripe runs from the base of the wing almost to the outer margin, forking near the middle of the wing. The hindwings are white and the abdomen whitish also.

Expanse. Male 20-25 mm. Female 25-31 mm.

This insect has a different egg laying habit from either of the foregoing. The eggs are inserted between the leaf-sheath and stem of the padi plant and are thus protected from possible enemies. The caterpillar is very similar in habits, living an active life for about six weeks, then pupating, usually outside the stem, but sometimes within it. In 9—12 days after pupation the moth emerges.

As just mentioned, the eggs are protected by the leaf-sheath, thus parasites cannot readily gain access to them. The caterpillar is also protected, but in spite of this it is subject to attack by a small parasite *Apanteles* sp. and the pupa is attacked by a small insect belonging to the superfamily Chalcidoidea. Over sixty of the latter have been bred from a single pupa. It is not yet known how either of these parasites attacks the host.

It would appear, however, that *Sesamia* is of very local distribution, and is not of great importance in Krian, but is particularly numerous in Penang and Province Wellesley. This may be connected with its alternative host plants, namely sugar cane and maize.

Sesamia is primarily a sugar cane borer, and a large amount of cane was originally grown in Province Wellesley and this land was turned directly into rice land.

The only place where *Sesamia* occurs in Krian has a similar history, but places where rubber replaced the sugar cane, and padi was subsequently planted near the rubber, are free from this insect, there being no plant in which it could live when the rubber was planted.

Should subsequent investigations shew that *Sesamia* is a regular pest in certain areas, other control measures will have to be elaborated.

The points of difference and similarity between the three species may be tabulated as under:—

	Diatraea.	*Schoenobins.*	*Sesamia.*
Egg.	Exposed on leaves (4—7 days).	Exposed on leaves (5—7 days).	Protected under leaf-sheath (4—5 days).
Larva.	Bores inside stem.	Bores inside stem.	Bores inside stem.
Pupa.	Usually protected inside stem.	In Cocoon inside stem.	Usually exposed.

It may be seen from the foregoing table that the only stage in which *Diatraea* and *Schoenobins* are exposed and susceptible to control, other than uprooting the plant, is the egg stage, while *Sesamia* is exposed in the pupal stage only, and even the pupa is occasionally protected within the stem.

The fact that these insects are protected during the major part of their lives has rendered control a somewhat difficult matter, and the possibility of control by natural enemies was therefore considered.

Before proceeding to this, a brief mention of control measures against stem borers of padi in other countries may be made.

In Java it is found that flooding is an effective control for the white stem borer *Scirpophaga auriflua* Z. and a rotation of crops is also practised.

The species of stem borer found in Malaya are not affected by flooding however, and it is quite usual to find the caterpillars living in parts of the stem well below water level.

Rotation of crops with padi is not practiced in Malaya.

In Japan, attempts have been made to breed parasites(1), light traps are used and are said to be effective and extensive flooding experiments have been carried out, but the writers do not know what results have been obtained.

With regard to light traps, in Krian it was found that the moths were not usually strongly attracted to light, and when collecting at night, it was found necessary to walk about with the lantern and catch the moths as they were disturbed.

Probably more moths are attracted to light during the harvest, when the stalks are cut and there are no suitable egg laying sites.

At such a time, the moths, in their search for suitable sites might come within the sphere of attraction of a light trap. There is no doubt, however, that the moths are occasionally attracted to light in large numbers, even at a good distance from the padi fields. The cause of this is not yet known. It may be as stated above, and only occurs at harvest time, but it may also be influenced by the stage of the moon.

Observations have not yet been sufficiently extended, but this year a moderate number of moths was observed at light in houses at the end of February and in early March, but not in sufficient numbers to suggest a flight.

On the 31st March and the 1st and 2nd of April, however, there was a distinct flight of the moths *Diatraea* and *Schoenobius*, the insects coming in thousands on the 1st April, but in lesser numbers on the other nights. This was just after the new moon, but also during harvesting, so the cause is obscure.

It is possible that small flights occur regularly at about the time of the new moon, other conditions being suitable, and that the extensive cutting of padi at the same time caused this swarm.

At present, the action of light traps is too uncertain to warrant their use as a regular control measure, but it may be possible later to use them at certain periods with good results.

Control by Natural Enemies.

The principle involved is either the selection of a parasite or predator which is already present in the country, and the breeding of these insects in vast numbers and their subsequent release in areas attacked by the pest, or the introduction of a parasite known to attack the insect, or an allied insect, in some other country.

The most important natural enemies of *Diatraea* and *Schoenobius* in Malaya appear to be minute insects which attack the egg, while in the case of *Sesamia* a related parasite attacking either the adult larva or pupa appears to be most numerous.

The parasites attacking the eggs of *Diatraea* are three in number, while four species attack *Schoenobius* eggs.

As it was necessary to fight both these insects it was naturally desirable to find a single parasite capable of attacking either species, rather than two species of parasite which might require different technique in rearing. Two of the parasites found satisfied this condition and it was therefore a matter of choosing between them.

The two parasites in question are—

1. *Trichogramma nanum.* Zehut.
2. *Phanurus beneficiens* Zehut.

The most suitable for experiment appeared to be *Trichogramma nanum,* for not only was it easier to handle, but as described later, it was capable of breeding in a suitable laboratory host other than its natural ones.

This parasite is a minute insect varying in length between 0.68 mm. and 0.54 mm.

In colour it is greenish black, with a tinge of yellow. The antennae are ochreous, those of the male being much longer than those of the female, and furnished with long hairs. The eyes are red.

From previous work in America, in which large numbers of a closely related species, possibly only a geographical race of *Trichogramma nanum,* namely *T. minutum* Riley, have been bred both for control of the Codlin Moth in Walnuts in California (2) and of sugar borers (*Diatraea saccharalis* Fab.) in Louisiana (3), it was decided to try the same laboratory host as is used in that country.

This insect, the Angoumois Grain Moth *Sitotroga cerealella* Oliv., is of world-wide distribution, and has the following points in its favour.

1. It is easily handled under laboratory conditions
2. It has a high reproductive capacity
3. Its eggs are easily handled

4. Egg laying can be artificially stimulated under suitable conditions for collection of clean eggs.

Sitotroga cerealella normally deposits its eggs loose in stored grain, and it was found in America (2) that it would readily lay eggs if a number of moths were placed in a small cage with a wire gauze bottom of 20 meshes to the inch. The feel of the gauze possibly approximates to that of closely packed grain, and thus stimulates the moths to lay. The eggs drop through the gauze into a shallow glass dish whence they may be readily collected. Positive results were obtained with these eggs as a host for *T. nanum,* and breeding operations on a moderate scale were commenced by the writers in July 1929.

The technique followed is essentially that devised by Flanders in California (2) but glass tubes are used as parasitising chambers instead of petri dishes, and the adhesive used for carding is a solution of chromed gum tragacanth, this being somewhat easier to handle than shellac.

The eggs are collected every morning and cleaned of scales and broken legs which may be mixed with them. They are then sifted over gummed cards, which are cut to such a size that each card holds 10,000 eggs. When dry, the cards are placed in a glass tube into the open end of which a smaller tube containing about 2000 parasites is inserted.

These tubes are now inserted into a hole in a wooden box, so that the tube containing the eggs is in the light, that containing the parasites in the dark. The parasites are attracted by the light where they find the eggs and immediately start to "sting" them and lay their own eggs inside them.

A powerful flood light is turned on at night and this keeps the parasites working so that the maximum parasitisation is obtained.

Each host egg produces one parasite and about 90% of the eggs are parasitised in this way.

Description of Apparatus.

Sitotroga cerealella is bred in wooden cages, in one half of which zinc trays are arranged, one above the other. These trays contain a mixture of bran and low grade rice, into which larvae of *Sitotroga,* in preference to eggs, are placed.

About six weeks from the date on which the eggs are laid, the moths emerge from the trays and pass over to the other half of the cage which is kept dark, since *Sitotroga* prefers dark situations.

In the early stages of the experiment, when the output of moths was comparatively small, they were collected by hand into tubes and then released into cages for egg laying.

Recently, however, since the number of moths increased rapidly, it was decided to adopt the method used in America for collecting them from the cages. This method comprises the use of a vacuum cleaner, with certain modifications.

The vacuum cleaner used is the ordinary household model, with the usual accessories.

Additional apparatus comprises a length of rubber piping about 2 inches in diameter, a glass cylinder of the type frequently used for rearing insects, a tin cone, a metal cylinder with a perforated zinc lining, and a wire gauze tray to place underneath the glass cylinder.

The metal cylinder has an opening at the top to which the collecting tube is fixed and an opening at the side to which connection is made by means of the rubber piping, to the vacuum cleaner.

In order to regulate the draught of air passing through, a baffle plate is fixed on the gauze lining immediately opposite the hole in that side of the metal cylinder to which the machine is connected.

When all the necessary connections are made, the machine is set in motion and the moths are sucked up from the breeding cages.

When they reach the metal cylinder they are prevented from being drawn into the machine by the perforated zinc lining. They then fall through the hole in the tin cone into the glass cylinder.

When two or three hundred moths have been collected, the glass cylinder is removed and a fresh one is placed in position.

Since the installation of this mechanical collecting device, the time taken by the staff in removing the moths from the breeding cages has been reduced by more than half.

Despatch and Release of Parasites.

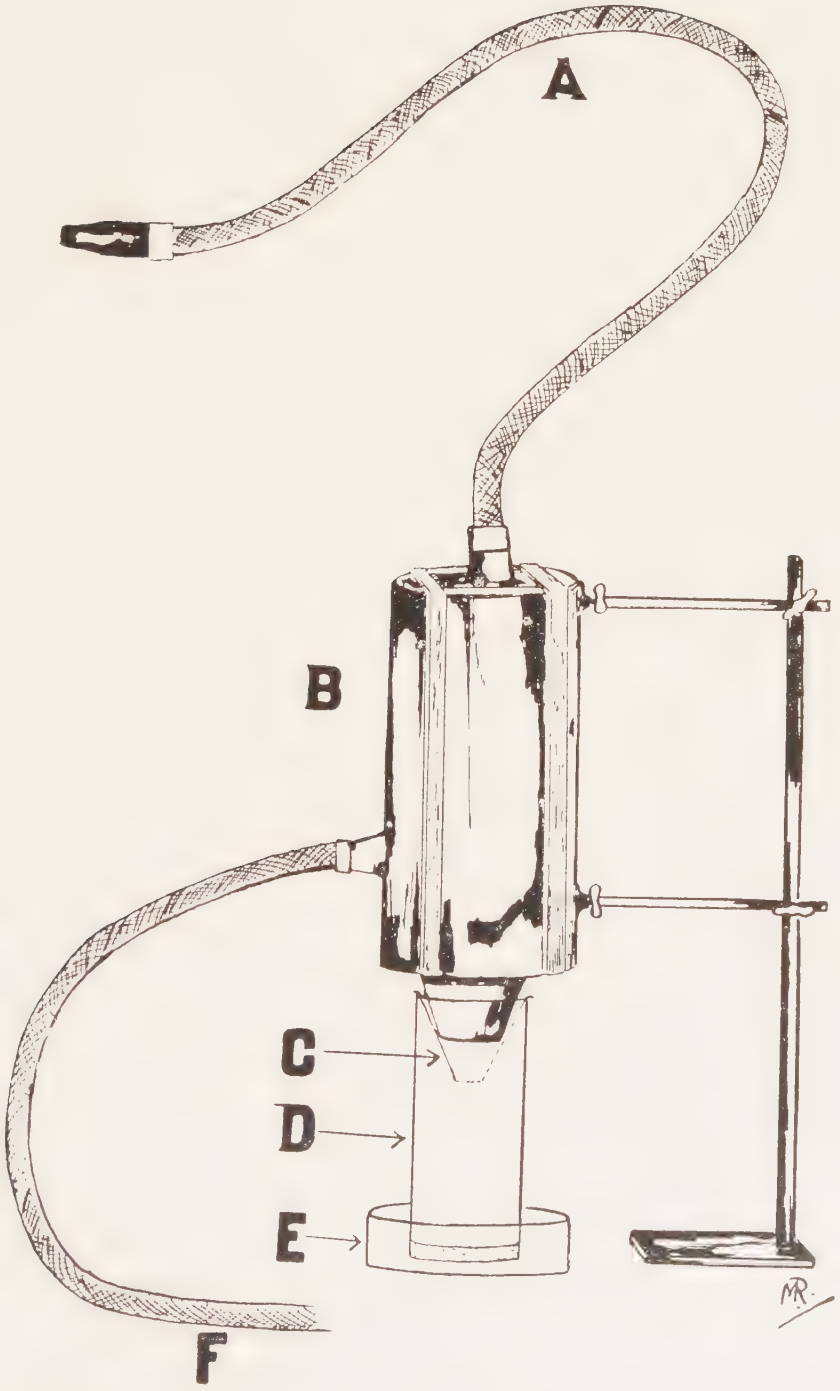
From the 1st January, 1930 up to the 30th June an average of 25,735 parasites were daily sent by rail to the Krian district for subsequent release.

The method of releasing the adult *Trichogramma nanum* in the rice field is as follows:

The egg cards are threaded on a piece of wire about six inches long and kept in place by bending up the end of the wire. The other end of the wire is twisted round near the top of some of the stalks of a hill of padi and arranged so that the card hangs free from the padi plant.

This method is based on that of Hinds and Spencer (3) for the liberation of *T. minutum* in sugar cane plantations in Louisiana. In the case of sugar cane, the egg card being free from the plant is protected from predatory insects to some extent, but it is doubtful whether this is necessary in the case of padi which grows so closely that a slight wind causes the egg card to come into contact with adjacent plants.

In the course of about three hours the majority of the parasites have left the egg card and dispersed. Examination of the egg card with a lens at this time shews that most of the remaining parasites are males and that there are a few unhatched eggs remaining. This corresponds to the observations of Hinds and Spencer for *T. minutum*.



Apparatus for Collection of Moths Bred in the Laboratory.

The cards are distributed at 10 to 20 yard intervals and if there is a wind blowing the cards are arranged in a line at right angles to the wind, and on the windward side of the area to be colonised, the parasites being distributed into the rice field by the wind.

When there is no wind, parasites are liberated at the four corners of a twenty yard square situated in the middle of the area.

This year, parasites have been liberated in Government controlled plots only, and although infestation by stem borers was undoubtedly checked at the beginning of the experiments, the invasion by stem borers from surrounding areas was high near the approach of harvest. Nevertheless, the parasites would appear to have checked the stem borers at a critical period, namely the growing period and the early stages of flowering and ripening, and it is anticipated that the yields from the colonised areas will be considerably better than from those areas to windward and on either side of the area colonised.

To leeward the effect of the parasites will probably be felt to a decreasing extent, the further away from the centre of liberation.

Yields from the various localities are not yet to hand but it is anticipated that they will confirm this opinion.

It is worthy of note that the padi areas to the windward of the main experiment shewed a very much heavier infestation by stem borers than did the colonised area and those to leeward of this area.

Conclusion.

It would be premature, at the present juncture, to express a definite opinion as to the likely results which should be the outcome of this experiment.

Without desiring to be unduly optimistic, however, the writers anticipate that a fair measure of success, at least, will be met with.

References.

1. On Some Injurious Insects of the Sugar Cane in Formosa. S. Matsumura.
2. Mass Production of *Trichogramma*. Stanley E. Flander (in litt.)
3. Utilization of *Trichogramma minutum* for Control of the Sugar Cane Borer. Journ. Econ. Ent. Vol. 21, 1928. W. E. Hinds and Herbert Spencer.

Explanation of Plate.

A. Tube through which moths are drawn into the cylinder B.
B. Metal cylinder with perforated zinc lining.
C. Metal cone.
D. Glass dish into which eggs fall from egg-laying cage.
F. Tube connected to vacuum cleaner.

CHINESE HATCHERIES

BY

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In the coastal portion of Krian District, Perak, there are several poultry farms owned by Chinese at which a fairly large number of ducks and fowls are reared for sale both in the local markets and in Penang. At these farms, eggs are hatched in special hatcheries providing a somewhat unusual and interesting method of incubation. This method gives a very satisfactory percentage hatch, though the actual percentage of chickens reared is not so good, owing to faults in the treatment of the young birds during the first few days after their emergence from the eggs.

A description of these hatcheries is given below and suggestions are made for improving the treatment of the very young chickens.

The hatchery visited consisted of two "batteries" of 6—8 hatching baskets one along either side of the front room of an attap house, while down the centre of the room was a two-tier stand where the eggs are placed the day before they are due to hatch out.

The batteries, as mentioned above, consist of 6—8 or more baskets depending on the length of the room and of course on the business done. The more business the more baskets employed.

The baskets are made after the style of a fruit basket 2 feet to 2 feet 6 inches in diameter and about 3 feet in depth. They are constructed of split bamboo or rotan. The baskets are placed in a wooden frame and are spaced about 12″—18″ apart. They are insulated all round with dry padi husk, or in other words, the intervening space in the frame is filled with dry padi husk. The sides and bottom of the basket are lined with movable cardboard. The egg capacity of the ordinary basket in use is 1,000 eggs. A square piece of burlap, a little larger than the bottom of the basket, is placed in the basket and a layer of eggs placed on top, the date of first placing the eggs in the basket being marked on the eggs. Another piece of burlap is placed on top of the first layer of eggs and then a second layer of eggs is put down and so on until the basket is full. A guni bag is usually employed for the top covering.

All eggs used in the hatcheries are freshly laid and before being placed in the hatching basket are exposed to the sun for one hour or so.

Eggs are "candled" by cutting a round hole in the guni bag which covers the window and holding up the egg to the day-light coming through the hole. The rapidity and accuracy with which the eggs are candled is astonishing.

When eggs are about due to hatch they are removed one day, or in some cases two days, before from the basket and placed on a two-tier stand in the centre of the room where they remain until the chicken or duckling emerges.

This two-tiered stand has its shelves made of closely woven rotan. Over the rotan is placed guni sacking, or mengkuang-matting, then the eggs, and on top of the eggs a blanket in which are cut holes through which the chicks or ducklings emerge. After emerging, the chicks or ducklings are removed and placed outside the house in an open rotan chick basket.

The percentage hatch is usually high and while 70% is a good figure to attain at home, I believe results in the hatcheries are even higher.

Hatching 70% and rearing 70% are two different propositions and it is in this respect that a weakness exists in the Chinese hatchery.

It has already been stated that as the chickens hatch out they are removed after their down has dried and placed in a round rotan basket outside the house. One day, two day and three day chicks are often mixed together in the same basket and all huddle together for heat with the result that the weak are trampled on and there are many deaths, the mortality in 1—3 days old chicks being 15—20%.

During the first week of a chick's life, the temperature it is exposed to in a brooder is usually 90°F. Were this temperature maintained at these hatcheries, the mortality would be greatly reduced. It would be quite a simple matter to improvise a wooden box and adapt it as a brooder and use an ordinary hurricane lamp for the source of heat.

THE WORLD'S COCONUT CROP*

BY

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Some useful information may be obtained from the statistics of nut, copra and oil exports from the nut-producing countries of the world recently prepared in the Imperial Institute, London.

In the final summary of these statistics, coconut products exported are all reduced to one common denomination namely, nuts, and to achieve this, the following nut equivalents have been employed:—

1 ton of copra = 5,000 nuts.
1 ton of oil = 8,125 nuts.
1 ton of nuts = 1,400 nuts.

It must, of course, be understood that these equivalents are not true for all localities because of regional differences in wet meat weight per nut, in oil content per nut, and in whole fruit weight. For Malaya, the figures should be about 10% less than those shown above. This purely incidental observation does not detract from the value of the comparisons which may be made by a study of the abbreviated Table of Exports which has been prepared from the statistics of the Imperial Institute.

In this Table, only coconut products (exclusive of soap and glycerine) expressed as nut equivalents and actually exported are shown. Because one-third of the copra trade of Malaya is in copra imported into Penang and Singapore from surrounding islands for conversion into copra locally or for re-export, in this and in similar cases due correction has been made, and only the true exports shown. In one case, where the figures for 1928 are not available, an estimated figure, obtained from the figures for the previous three years is given instead.

The pre-eminence of the Philippine Islands and the Netherland East Indies as nut-producing and copra-producing countries is very marked. Between them they produce about two-thirds of the world's nuts and over one half of the world's total annual production of copra which is in the neighbourhood of 100,000 tons of copra equivalent to 5,000,000 nuts. In copra production for export, Malaya comes fifth, with Ceylon a close sixth, though if consideration is allowed for the copra converted into oil in Ceylon then that colony becomes the senior copra producing country of the two.

* The following is an analysis of Statistics prepared by the Imperial Institute, London.

In the export of whole nuts, Malaya comes a good third. The collection of nuts for this purpose is confined to a few small districts, the bulk being mainly exported through Penang to Burma. Such nuts, whether for home use or for export are preferred underripe and for this reason, where nuts are picked both for conversion into copra and for human consumption, the quality of the copra is apt to suffer, as the very underripe all-green nuts which are preferred for eating yield only about half the weight of copra which may be obtained from fully ripe brown nuts, and the oil percentage of the copra obtained is much lower.

It will be seen that among the nut-producing regions of the world, the Philippine Islands take the lead for oil production, because nearly half the annual crop is converted into coconut oil on the spot. Ceylon comes next by crushing 38% of its annual crop. About one half of the oil so produced is imported to Great Britain and India takes a large proportion of the remainder for cooking and for domestic use. The Netherlands East Indies follows next in order and although only 10% of the annual crop is turned directly into oil, the aggregate so converted is almost equal to that for Ceylon. Malaya, on the other hand, is a bad fourth and although of the nuts produced locally, 10% are converted to oil, the aggregate is very small. When consideration is allowed for the total nut equivalents imported and also for these consumed locally, the oil production drops to 5% of all the nuts handled.

In Malaya, oil mills are to be found at Penang, Singapore, Klang and Kuala Selangor, but very little of the oil produced is for export to Europe or to the U.S.A., but is consumed mainly in Malaya and in the surrounding countries in the form of cooking oil and soap, and for other domestic purposes.

The explanation for the continued pre-eminence of the Philippine Islands in oil production may be due to the fact that they have satisfactory markets for cattle cake in the U.S.A. and Eastern Siberia or else to the absence of import duties and the preferential tariff for the entry of the oil into the U.S.A. This industry was first established on a large scale, on account of high prices ruling during the war. The exports of oil and copra from the Philippines are now nearly three times what they were in 1917 and it would appear that the stimulus of war prices resulted in a considerable extension of the planted areas which have since come into bearing.

The total consumption of nuts in all forms in Malaya is high, and may be estimated at 50 nuts equivalents per annum per head of the population of 4,000,000 people. This brings the total consumed locally to the not inconsiderable total of 200,000,000 nuts equivalents, or 25% of the annual crop. While this does not appear in the Table of Exports, the exports of nuts and oil for native consumption to the surrounding islands is, of course, included in the figures shown.

If allowances is made for local consumption of nuts in coconut growing countries at an overall average of 10% of the crop, the world's annual yield of coconuts may be estimated as being in the neighbourhood of 8,000,000,000 nuts.

The World's Annual Coconut Crop—1928.

Table to show in what form nuts are exported, and the total number of nut-equivalents exported from each of the principal coconut producing regions of the world.

Millions of Nuts Exported.

Locality		As Nuts.	As Copra.	As Oil.	Totals Exported.
Dutch East Indies	...	N	2,191	255	2,446
Philippines	...	N	1,154	1,137	2,291
Oceania: Fiji	...	N	342	N	
New Guinea	...	N	230	N	
Solomons	...	N	78	N	
Tongan Isles	...	N	110	N	
West Samoa	...	N	60	N	
New Hebrides	...	N	51	N	
Papua	...	N	48	N	
Gilbert Isles	...	N	13	N	
		—	932	—	932
India & Ceylon:					
Ceylon	...	18	494	317	
Malabar, etc.	...	N	½	2½	
	...	18	494	320	832
British Malaya					
Federated Malay States	...	N	342	N	
Unfederated Malay States	...	N	190†	N	
Straits Settlements	...	9	N‡	60	
Sarawak	...	N	10	N	
North Borneo	...	N	16	N	
		9†	558	60	627
West Indies, Etc.					
Trinidad	...	7	48	2	
Jamaica	...	31	17	N	
British Guiana	...	N	17	1	
Remainder	...	N	6	N	
		38	88	3	129

East Africa.					
Zanzibar	...	½	47‡	½	
Tanganyika	...	N	47	N	
Mauritius	.	N	7	N	
Kenya & Uganda	...	N	7	N	
		½†	108	½	109
West Africa.					
Nigeria	...	N	½	N	
Sierra Leone	...	N	N	N	
Gold Coast	...	N	7	N	
		—	8	—	8
GRAND TOTALS	...	65	5,533	1,176	7,374
			Million nut-Equivalents.		

N = Nil or negligible.
† = Approximate estimate.
‡ = Corrected for imports.

MALAYAN OIL PALM INDUSTRY IN 1929

BY

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The statistics relating to the progress of the oil palm industry in Malaya are revised annually by the Department of Agriculture so that it is possible to view the growth of the industry since its inception. Reference to the table of the annual plantings of this crop shews that although experimental areas were planted in 1913 and onwards, the first planting of the crop on a commercial scale was on one estate in Selangor which commenced planting in 1917. In 1920 another estate in Selangor planted a small area. In the following year these two estates planted considerable areas and a third estate in Selangor commenced planting. The total number of oil palm estates which existed in subsequent years is as follows:—1922—three; 1923—six; 1924—nine; 1925—twelve; 1926—nineteen; 1927—twenty-one; 1928—twenty-three; 1929—twenty-seven. These estates are distributed as follows:—Selangor, fifteen estates; Perak, four estates; Negri Sembilan, two estates; Pahang, one estate; Johore, five estates. Only estates that have over 100 acres planted at the present time are included in the above figures.

One estate has practically 5,000 acres planted, nine estates have between 1,000 and 3,000 acres planted; eight estates have between 500-1,000 acres planted, while there are nine estates of less than 500 acres planted. As detailed in Table I, the total area planted with oil palm at the end of 1929 was 31,709 acres, distributed as follows:—Selangor, 12,674 acres; Perak, 8,296 acres; Negri Sembilan, 902 acres; Pahang, 686 acres; Johore 9,111 acres; Kedah 20 acres.

Reserve land held by the above estates is as follows:—Selangor estates 3,718 acres; Perak estates 8,068 acres; Negri Sembilan estates 1,418 acres; Pahang estates 1,817 acres; Johore estates 760 acres: a total of 15,781 acres.

Land alienated in 1929 for the cultivation of oil palms amounted to 39,060 acres distributed as follows:—Selangor 9,303 acres, Negri Sembilan 557 acres, Johore 29,200 acres.

If the land in Malaya already alienated for oil palm cultivation be planted up, the total area under cultivation will be approximately 120,000 acres.

The following areas have been ear-marked by Government for the cultivation of oil palms, but have not yet been alienated: Kuantan, Pahang 13,800 acres; Dindings, Straits Settlements 7,000 acres; Tampin, Negri Sembilan 9,000 acres. These figures should, however, be accepted with caution, as in

TABLE I.

Annual Planting (in acres) of Oil Palm in Malaya.

State.	Year.															Total Acres.
	1913	1914	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	
Selangor -	12	2	100	253	270	470	821	394	1877	1848	1309	1911	2026	476	905	12674
Perak -	...	...	...	...	...	...	...	...	...	220	...	478	1818	2763	3017	8296
Negri Sembilan -	...	...	...	...	...	...	...	...	...	..	...	100	500	...	302	902
Pahang -	...	...	...	...	...	...	...	...	...	...	...	...	...	592	94	686
Johore -	...	...	...	...	...	...	...	30	...	10	962	1289	2831	1005	2984	9111
Kedah -	...	...	...	...	...	...	...	...	...	...	...	...	...	...	20	20
Total planted annually -	12	2	100	253	270	470	821	424	1877	2078	2271	3778	7175	4836	7322	...
Total planted to date -	12	14	114	367	637	1107	1928	2352	4229	6307	8578	12356	19531	24367	31689	31689

most cases it is not known what proportion of these areas are suitable for the cultivation of oil palms.

At the end of 1929, eight estates were equipped with factories for the preparation of palm oil of high quality, and for the extraction of the kernels. In every case the centrifuge system of oil extraction was adopted. In addition, five factories are in course of erection and will commence working during the year 1930.

The annual net exports of palm oil and palm kernels, abstracted from the monthly Return of Foreign Imports and Exports are shewn in Table II. These returns, however, do not give a true figure of the production of these commodities as there is now a small import of palm oil for re-export, and an import of seed at high prices for planting purposes. The annual production of palm products, compiled from returns supplied by all estates in the country, is stated in Table III, which is complete from the year of the first production in Malaya.

The estimate of production in 1930—based on returns from estates—is as follows:—Palm oil 3,100 tons; palm kernels 620 tons.

TABLE II.

Annual Net Exports of Palm Products from Malaya.

Year	Palm Oil		Palm Kernels		Total Value Palm Products
	Tons	Value $	Tons	Value $	$
1926	726	254,165	180	36,708	290,873
1927	852	269,966	178	31,763	301,729
1928	1,460	384,954	261	43,475	428,429
1929	1,831	499,308	266	38,503	537,811

TABLE III.

Annual Production of Palm Oil and Kernel in Malaya.

Year	Palm Oil	Palm Kernels
	Tons	Tons
1923	195	50
1924	286	81
1925	536	110
1926	716	168
1927	915	185
1928	1,345	286
1929	1,819	311

Abstracts.

THE TRANSPORT OF FRESH FRUIT BY SEA.

In a recent number of *The Malayan Agricultural Journal*, attention was drawn to a report on trial shipments of pineapples from Zanzibar to England. The transport of fresh fruit by sea from the tropics to the temperate zone presents many difficulties, not the least being the seasonal variations in climate and the variations in temperature during the voyage.

The successful solution of the problems, however, opens up promising markets. The interest of Malaya in this subject naturally centres in the pineapple industry, but there are other fruits which would doubtless find a ready sale in the United Kingdom, if the transport problems could be overcome. The mangosteen, chiku and the insufficiently known duku, in addition to the pineapple, suggest themselves as suitable for this market. It is probable that the durian, although popular locally, would be less appreciated in Europe.

Two publications* in Dutch, entitled "Some particulars of Refrigeration of Trial Shipments of Dutch East Indian Fruit", and "Fresh Pineapples from Surinam", both by Ir. W. Spoon, give interesting information on this subject. A review in the Kew Bulletin† on trial shipments of mangosteens, inaugurated at the instigation of the Commercial Museum of the Colonial Institute at Amsterdam, in co-operation with the Department of Agriculture (and probably also the work of Ir. W. Spoon) is also pertinent. The following notes are abstracts from the two first mentioned publications.

Much experience has been gained on the subject of the shipment of fresh fruits to England from Australia and South Africa. For particulars of this work, the reader is referred to the summary of results, given by F. Kidd in three lectures before the Royal Society of Arts, London, under the title of "Biology and Refrigeration".‡ It should be noted that the following descriptions refer to the small refrigeration rooms, more accurately termed cells.

Equipment. The refrigerating cells are of a rectangular shape, are 2 to $2\frac{1}{2}$ metres high and have a wall area of about 20 square metres. Along the walls are tube radiators in which the liquid ammonia is evaporated. The cell is air-tight. When in use, the air can be renewed if necessary with cold air (cooled

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* Published by Berichten van de afdeeling Handelsmuseum van de Koninklijke Vereeniging Kolonial Institute Nos. 47, 48—1929.

† A Review by F. N. H. published in the Royal Botanic Gardens, Kew Bulletin of Miscellaneous Information, No. 2—1930.

‡ Journal of the Royal Society of Arts, Vol. 77, pages 269, 288 and 313—(1929. See especially pages 295-298 for observations on ship's refrigeration rooms for such fruit transport.

before supply). The cell is provided with an electric fan which works throughout the voyage to keep the air in movement.

Humidity. Humidity records with dry and wet bulb thermometers shew a figure around 93—94% for homeward voyages, and about 91% for outward voyages.

A shipment of chiku in 1929 arrived in Europe with conspicuously wrinkled skins, caused by loss of moisture during the voyage. Such evaporation is only possible when the refrigeration room is especially dry.

Temperature. The refrigerating rooms stocked with fruit, were kept at a temperature of +3°C.

Fresh Pineapples from Surinam.

There has been considerable discussion of late regarding the possibility of exporting canned and fresh pineapples from Surinam. Promoters appear optimistic, but although, in the case of the canning industry, comparisons are made with the existing industries in Hawaii and Singapore, similar research regarding the possibilities of exporting the fresh fruit appears to have been omitted. It is necessary to consider the market for such fruit and the methods of transport to the market.

Markets. The market to which attention is drawn is the Netherlands. In that country, fresh pineapples are considered a luxury in comparison with other fresh southern imported fruits, such as bananas, oranges and lemons. It is stated that in 1926, the Netherlands consumed 70 tons of pineapples and 19,124 tons of bananas. The conclusion is reached that the market for fresh pineapples is small and it would be necessary for the promoters to stimulate demand for pineapples by propaganda. Other points of importance in this connection are—size of fruit and price at which it could be profitably sold.

In respect of varieties, the fruit of the various species of pineapples can be divided into two main groups. In the one group, the ripe fruit is of an even yellow colour, of moderate size, pulp rather dry but with a fine fibre. In the second group, the fruits are large, the fibre coarser, but with more juice; when ripening, colour changes unevenly. A few well-known representatives of the first group are the "Monsterrat", "Ripley Queen" and "Nanas Bogor".* Representatives in the second group are the "Smooth Cayenne" or "Cayenne Lisse" and the "Giant Kew". For the purpose of selecting the species suitable for export, consideration must be given to these differences. The exporter must decide whether it will be easier to create a demand for a small pineapple or for a more expensive large pineapple.

Transport. Europe's principal suppliers of fresh pineapples are the Azores and South Africa. The Azores are comparatively near, the fruit only taking about ten days on the voyage. Transport from South Africa takes about three

* "Nanas Bogor." Javanese name for a pineapple of this type originating from Bogor (Buitenzorg).—Translator.

weeks, necessitating cold storage during the voyage. For the much shorter voyage from the Azores, which it must be remembered is situated about 38° northern latitude, storage in a well ventilated hold is sufficient. Against the advantages is the disadvantage that the fruit has to be grown under glass, whereas in South Africa it can be grown in the open, thus lowering the cost of production.

Conditions in Surinam approximate to those of South Africa necessitating refrigeration. In spite of the fact that in the middle of 1928 a successful shipment of fresh pines was sent from Surinam to Europe, it is unlikely that this system would prove satisfactory for regular shipments, owing to the great differences in climatic conditions in the course of a year.

The successful shipping of fresh pineapples in refrigerating rooms is by no means certain. The Food Investigation Board in 1927† drew attention to the unsatisfactory results of shipping South African pineapples, especially to their poor keeping qualities after being landed. The Fruit Export Control Board in Cape Town has since admitted that the pineapple is still the least satisfactory South African fruit for purposes of export.

It should not be concluded that the successful shipments of pineapple from Surinam is an impossibility, but rather that careful research should be made and advantage taken of the experience gained in other countries. The fruit must be suitably packed and the temperature of the refrigerating room carefully regulated.

In South Africa, crates for packing pineapples are 27 × 14 inches for Queen Pines and 27 × 16 inches for the Cayenne variety. Such crates contain a single layer of pineapples in fine shavings. A larger shape of crate is also used, but as this provides for a double layer of fruit, it is considered less satisfactory.

The method of packing pineapples from Java are discussed. In the main, these follow the lines of the South African experiment. The following two methods were the subjects of experiments in Java:

(a) Flat crate holding a single layer of fruit, laid top to base alternately to save space: dimensions of crate 80 × 36 × 17 centimetres. Padding: Coconut fibre.

(b) High crate holding two rows of fruit, which stand on their stiff leafy crest. Inside the crate, near the top are fixed two slats to which the stalks of the pineapple are tied. Dimensions of crate 64 × 25 × 26 centimetres. No padding.

Finally, there is the question of temperature in transit. In the trial shipment from Java it was found that a temperature of +3 to +4°C was unsuitable. Greater success is expected from a temperature of +6 to +7°C.

† Report of the Food Investigation Board for the year 1927. Page 40—London 1928.

Reviews.

The Improvement of Yield in Hevea Brasiliensis

BY

F. Summers, B.A., M.Sc., B.Sc.

Singapore, Kelly & Walsh, Ltd., 1930, pp. 198 and List of Works Referred to. Price $5/- (Straits Currency).

The author of this informative and attractive book has set out to summarise the work accomplished in the East Indies with the object of improving the yields of Hevea. Unquestionably he has succeeded.

The book provides a concise guide to those who are concerned with attempts to increase the production of latex from the rubber tree. The subject matter is divided into three chapters, namely, (I) Budding, (II) Seed Selection and Breeding, and (III) the Early Diagnosis of High Yielding Plants. Chapter 1 follows generally the lines of Col. Summers' previous publication, "The Budding of Hevea in Modern Plantation Practice," Planting Manual No. 2, published by the Rubber Research Institute of Malaya. Under each chapter, the facts adduced are presented in a clear manner and provide adequate information on the various aspects of the problem under consideration.

The history of the early efforts with budding in the Netherlands East Indies, Malaya and Ceylon are outlined. Of particular interest is the record of pioneer work undertaken by Major Gough at Prang Besar Estate, Kajang. With regard to the present position, Col. Summers states that there is now available a wide range of proved clones which, if the trees are grown 80 to the acre, should furnish yields of at least 500 lbs. of rubber per acre in their sixth year, 800 lbs. in their seventh year and at least 1,000 lbs. in their tenth year.

The budding method is described in detail, the essential features of which were widely demonstrated by the Department of Agriculture in 1921 and 1922. Useful instructions regarding the packing and storage of bud-wood are also given.

The chapter on seed selection and breeding is of less concern to the planter; the author makes it clear that prospects of yield improvement by methods of seed selection are still remote, whereas the budding method has not yet been developed to meet a tithe of the demands that may be made of it in the hands of the planter.

In the final chapter—Early Diagnosis of High Yielding Plants—the numerous attempts to demonstrate relationship between yield and certain

characters of the latex vessel system are referred to. Col. Summers deals to some purpose with the "Ashplant method" or "tube bore theory" which was so loudly acclaimed during the latter part of 1928.

J.N.M.

Principles of Tropical Agriculture

BY

H. A. TEMPANY, D.Sc., F.I.C., F.C.S.

and

G. E. MANN, M.C., M.A.

This book, which is published under the auspices of The Incorporated Society of Planters, Malaya consists of twenty chapters of 328 pages, together with a bibliography, index and 25 illustrations. The book is conveniently divided into two parts (1) Limiting factors in crop production, (2) Agricultural Practice

As is well known, the senior author has had a long and wide experience of tropical agriculture as Director of Agriculture in the West Indies, Mauritius and more recently in Malaya and is one of the world's authorities on sugar cane cultivation; while the other author has had considerable experience in instructing Malay Students in the applications of science to the art of agriculture.

The principles of agriculture are essentially the same in temperate, sub-tropical and tropical countries, but the methods of application of these principles differ considerably in the various agricultural regions of the world owing to climatic and other factors. The second part of this book on agricultural practice, therefore, applies particularly to tropical agriculture.

Students of tropical agriculture will be especially interested in Chapter IV on the climate of the tropics, which is such an important factor in tropical agriculture, although the whole of Part I conveys a sound knowledge of the many factors which influence crop production in all countries.

The Second Part of the book, on Agricultural Practice, will enable the student to appreciate how these limiting factors may be overcome or their efforts reduced. The practical planter or farmer does not always realise the limitations imposed on the scientific agricultural adviser by the conditions on the estate or farm. Scientific advice is limited by the question of economics. Improvements can be effected on practically all cultivated areas by appropriate treatment, but the application of the methods recommended depend frequently on the cost of the method, the rate at which improvement can be effected and the value of the crop obtained as a result of the method of treatment.

Two interesting and valuable chapters in Part II are those dealing with Plant Pests and Diseases and the Economics of Crop Production in the Tropics.

Information on these important agricultural problems are frequently omitted or discussed in a few paragraphs in books of this nature.

The influence of ethnographical factors on agriculture, for example, is to be seen particularly in a densely populated country such as Java.

In no other art or industry are so many factors concerned as in the art of agriculture and in many respects the application of scientific knowledge to this industry is in its infancy.

The authors are to be congratulated on their efforts in compiling a valuable textbook, which should be in the hands of all planters. It can be recommended also for the use of agricultural educational institutions.

The book is well printed and is remarkably cheap at the price of $4.50.

B.J.E.

Annual Report of the Rubber Research Institute of Malaya for the year 1929.

The annual report of the Rubber Research Institute of Malaya for 1929 is to hand and is a document of considerable interest.

The report divides itself into ten sections and deals with the activities of the various divisions of the institute.

It is gratifying to be able to record that the institute has now settled down to a period of steady production. The initial difficulties consequent on organisation have now been overcome and it is clear that its activities are meeting with a wide measure of appreciation from the planting public. It is to be noted in this connection that the acting Director remarks that the advisory work on behalf of estates has interfered considerably with research programmes and that this is to be regretted in some respects. On the other hand, it may be observed that an institution of this type is of little value unless close contact is maintained with the planting industry which it is intended to assist. A *reductio absurdum* would be a condition of affairs in which a research institute carried out a large volume of research work to which no attention was paid by the industry which it was intended to benefit. Consequently, although the volume of research work may to some extent be diminished by the advisory activities which the Institute has been called upon to fulfil, there is no question that in the aggregate there is a balance of gain, inasmuch as practically all research officers have been constantly brought into touch with the planting community and so cannot have failed to realise the limitations imposed by practice and to maintain a practical outlook.

It is becoming clear that the most important role of the Field Division of the Institute lies in undertaking liaison between the research worker and the planter. The definition of relation thereby afforded is all to the good.

In a cognate connection allusion may also be made to the marked advance which has been achieved in affecting liaison with other bodies engaged in similar work, particularly with the Department of Agriculture and the Department of Co-operation. A notable effort in this connection has been the organisation of a propaganda caravan to be administered jointly by the three bodies. It is also to be noted that the activities of the Institute have now been definitely correlated with the work of the Department of Agriculture and it has been agreed that for all matters concerned with the administration of disease control measures and also for propaganda among small holders, the Department of Agriculture should be responsible acting in collaboration and in close touch with the Institute.

Effective collaboration has also been rendered by the Institute to the Department of Co-operation in its scheme for the establishment of co-operative rubber factories for small holders.

It is not too much to say that the success or failure in an institution of this type depends very largely on its relationship with the planting body and cognate official institutions, so that the advances recorded in these respects must be regarded as of importance.

On the research side, work has followed the research programmes which have been laid down. Particular interest attaches to the botanical investigations which have had to do with the trying out of known clones and with the establishment of new ones, also to the work which has been carried out on the anatomical processes attending the union of scion and stock in budding as well as in relation to pollination and seed selection.

Some confusion may still exist in the minds of planters in Malaya as to the relative merits of budded material as against selected seed and the definition of the respective roles which these two operations are likely to play is consequently important. It seems clear that in future, work will tend more and more towards the development of high yielding strains by cross pollination and the propagation of these strains by budding.

In relation to soils, the performance of a considerable amount of useful work is recorded; the remarks of Dr. Haines on the role of soil analysis are very much to the point, inasmuch as there is probably no subject in the whole range of agricultural science concerning which so much misconception exists as to the value of soil analysis.

In relation to pathology, no particularly new or striking occurrence is recorded, if we except the considerable extension of secondary leaf fall which has been observed. Attention may, however, be called to the question of testing various mixtures used as fungicides in treating bark diseases. The need for some reliable guide for the testing and standardising of such products is becoming more and more apparent, especially when the rapidly growing list of proprietary and other preparations available for use in this connection is considered.

In the report of the chemical division, special attention may be called to the work done on mould developments in sheet and crepe rubber and also to the work of Dr. Rhodes in relation to latex investigations.

A special section of the report deals with the progress made at the experiment station at Sungei Buloh. Work on this area was commenced in 1928. Up to the end of 1929, 838 acres had been cleared, 571½ planted, while a further 73 acres had been lined for planting. Simultaneously, a number of buildings have been erected, plans for extensive field experiments worked out by the various divisions and a considerable planted area established under experiments. The rapid progress made in getting the station into working order reflects great credit on all concerned.

An institution such as the Rubber Research Institute cannot be expected to attain its full value until a number of years have elapsed since the date of inception.

The report, however, clearly indicates that it has now been established on sound lines and that a satisfactory programme of work has been evolved. There is no reason to doubt that, given a continuation of the existing policy, the Institute will continue to increase in efficiency and utility from year to year and fully justify the hopes that were entertained at the time the project was first formulated.

H. A. T.

MALAYA AT THE BRITISH INDUSTRIES FAIR 1930.

Malaya occupied a corner stand at the British Industries Fair, held at Olympia in February and March of this year. The Malayan exhibits were of a general nature though special prominence was given to oil palm products and canned pineapples.

Tins of Malayan pineapples were displayed under every obtainable label and in all standard packings. As at other exhibitions, the opinion was frequently expressed that certain brands of the Golden Quality Malayan pineapple can now compare, as regards flavour and grading, on level terms with competing countries. Correspondence indicates that fresh business has accrued to importers as a direct result of the participation of Malaya at the Exhibition.

Malayan coffee attracted some attention, but its quality drew unfavourable comment from experts, chiefly on account of the amount of broken and inferior berries.

Enquiry was received for samples of kapok seed for experimental purposes, with the object of extracting therefrom a solvent used in varnish manufacture.

Mr. H. S. Banner, Publicity Agent at the Malayan Information Agency, who was in charge of the stand, in reporting on the Malayan exhibits, adds that there was a most satisfactory enquiry from representatives of schools all over the country for the Card of "Products of Malaya" which was prepared last year for educational purposes.

OBITUARY.

Mr. L. C. Brown.

We regret to announce the death, at the age of 79, of Mr. L. C. Brown, at Penang on 19th June, 1930.

Mr. Brown arrived in Penang in the year 1870 and at the time of his death was the oldest European resident in the Settlement.

In 1902, Mr. Brown was appointed Inspector of Coconuts, Federated Malay States. The creation of the post was rendered necessary on account of the alarming increase in the incidence of coconut pests. For this post, Mr. Brown was well qualified by reason of his long acquaintance with Malayan agriculture, his knowledge of the Malays—their language and their country—and by his infinite tact which enabled him to rely on persuasion rather than on the laws for the performance of his duties.

The Department of Agriculture, F.M.S., was formed in 1905 and Mr. Brown's division was afterwards incorporated in the Department.

In addition to informative articles in this Journal, Mr. Brown was the author of Bulletin No. 11 of this Department, published in 1911 on "Coconut Cultivation", which was in steady demand for some years and has long since been out of print. Mr. Brown's interest in agriculture did not cease on his retirement from Government service in 1914, for in collaboration with the late Mr. Munro he published that authoritative book "Practical Guide to Coconut Planting" which needs no further introduction, for a well-thumbed copy can be found on the book-shelf of most coconut planters in this country.

The Late Mr. Lewton-Brain, some time Director of Agriculture, wrote of Mr. L. C. Brown on his retirement:—"Not only with regard to Coconuts, but in many other branches of Agriculture, Mr. Brown has acquired an immense fund of knowledge, which was of the greatest value to the Department of Agriculture and to planters generally. If ever an out-of-the-way subject came up for enquiry, Mr. Brown was always applied to and usually had valuable information to impart."

"Laurie" Brown—as he was always familiarly known to his large circle of friends—will be very much missed, especially in Penang, where he settled on his retirement.

In bidding an affectionate farewell to this pioneer of agriculture in Malaya, his old colleagues and friends in the Department of Agriculture will be joined by his friends throughout the country—and especially by coconut planters—in placing on record this appreciation of the value of Mr. L. C. Brown's work to the coconut industry of this country.

Miscellaneous.

ENTOMOLOGICAL NOTES.

Second Quarter, 1930.

Specimens of the Cantharid beetle, *Epicauta ruficeps* Ill., were received from Upper Perak and Kerling, Selangor, on the 13th. and 15th. May, 1930. At the former place, they were reported eating spinach and cabbage and in the latter, vegetables. The Manager of the Estate at Kerling sent information to the effect that there were literally thousands of these beetles which devoured most of the foliage in a very short time. In replies it was suggested that the increase of *Epicauta* was generally associated with the appearance of grasshoppers (or locusts) as their larvae devoured the eggs of grasshoppers. No exceptional increase in the numbers of grasshoppers was observed at these places, but it is noteworthy that on the 17th. May, specimens of the locust, *Locusta migratoroides* Rch. and F., were received from Negri Sembilan, with a report that they were caught about 2 miles north of the Tampin—Gemas Road. This area, consisting for the most port of lalang covered slopes, was inspected on the 18th. and treated with a poison bait on the 19th. May.

Daily inspections were made during the next week when locusts were found in two other "lalang" grass areas. In the following week the original area was again treated with bait. On this occasion very few locusts were seen in the original area and in the two other reported areas locusts were widely distributed. Daily inspections were made and the areas examined thoroughly during the week commencing 23rd June, in an endeavour to find other localities. In two of the original areas no locusts were observed but in another area a few locusts were discovered. A comparatively recent theory has been advanced suggesting that *Locusta migratoroides* has two phases, viz:—a solitary and a swarming (migratory) phase, with a transitory stage which may be a reversion to the solitary phase or a progression to the swarming phase. It is not known at present to which phase this locust is tending.

It is interesting to observe that the first record of the presence of *Locusta migratoroides* in Malaya was in 1911 in the neighbourhood of Port Dickson and no instance of its occurrence has been observed, solitary or otherwise, since 1919.

Coconuts.

Enquiries concerning the black or rhinoceros beetle, (*Oryctes rhinoceros* Linn.) and the red-stripe weevil, (*Rhynchophorus schach* Oliv.) are not generally numerous, but during this quarter, information was sought as to the value of "traps" for the first named and as to the control of the second named insect.

Traps consisting of refuse or dung have been found successful as an aid to the reduction of black beetles but they should be inspected every two months otherwise they may be responsible for increasing the number of beetles. For this reason the use of traps has not been advocated to any extent in Malaya. The destruction of breeding places should be the aim in the control of this insect. It seems hardly necessary to recall that the black beetle attacks the crowns of coconut and other palms whilst its grubs live in refuse, manure heaps and similar material. Referring to the red stripe weevil, it has been demonstrated conclusively that this insect cannot lay its eggs in sound uninjured palms. (v. Bulletin No. 36). By the prevention of mechanical injury and the destruction of *Oryctes* breeding places, this insect can be controlled.

Specimens of *Aleurodicus destructor* Mask. have been received on two occasions. This insect is revealed by a mass of white waxy filaments on the undersurface of the leaflets of coconuts. At one time, this white fly was considered to be a potential pest to coconuts in Malaya, but up to the present it is only very occasionally found and then it attracts attention by its appearance rather than by its injuriousness.

Caterpillars of *Parasa lepida* Cram. have been reported causing slight injury to coconuts. They are rarely troublesome to coconuts in Malaya and are parasitised by *Apanteles parasae* Rohw.

Coffee.

Regular weekly collections of coffee berries have been made during the last two months on an estate in order to find out if by such a procedure the percentage number of berries attacked by the beetle berry borer (*Stephanoderes hampei*) can be reduced. Two areas of coffee are cultivated on this estate and the different varieties in each area are grown in close proximity to each other. The results of these examinations are given below:—

AREA I.

Variety.	May. Percentage infected berries.	June. Percentage infected berries.
Quillou ...	67.81	62.44
Robusta ...	18.96	2.96
Canephora ...	32.66	6.02
Uganda ...	30.71	11.57
Excelsa ...	23.52	1.51
Liberian ...	5.17	0.98
Abeocuta ...	11.21	0.47

AREA II.

Variety.	May. Percentage infected berries.	June. Percentage infected berries.
Quillou ...	25.72	2.98
Robusta ...	24.13	1.69
Canephora ...	15.93	14.03
Excelsa ...	17.77	0

These figures are decidedly interesting as a reduction in the percentages of bored berries in each variety has taken place. Quillou would appear to be the most susceptible to attack.

Gutta-Percha.

Stauropus lichenina Butl. The caterpillars of this Notodontid moth have been troublesome for some time by eating the leaves of gutta percha and in some cases have been responsible for completely defoliating plants on Selborne Estate, Pahang. The attacks of these insects appear to be sporadic, occurring at considerable intervals. It might be that they increase in numbers at the beginning of the year as do some other species of insects in Malaya. The life-cycle takes about 31 days, egg stage 5 days, caterpillar stage 17 days and pupal stage 9 days. In a letter concerning this insect, information was received that the Manager successfully dealt with the eggs by spraying with a kainit solution of 8 ozs. to 1 gallon of water and a further letter stated: "We first tried the same in the given solution against young caterpillars and although no useful results can be recorded in this direction except that it affected their rapacious appetite and deterred them from feeding—an attendant result was found in that the remaining unhatched eggs appeared to be affected and after a lapse of 24 hours appeared to whiten and become lifeless.

"Further areas, where eggs were abundant on the trees, were then sprayed, also a series of check experiments with controls was commenced under bell jars and these went to confirm the field experience in that the eggs appeared to be rendered sterile as no caterpillars hatched from them and it was thought that probably plasmolytic action had taken place."

In reply, the writer asked for confirmation that unsprayed eggs hatched in a normal manner and suggested that parasites were the possible cause for their non-hatching. In a lengthy reply, the following statement was made. "The eggs which were not sprayed hatched out quite normally and good healthy broods of caterpillars resulted as contra to those on the sprayed leaves. In order to make a good trial the batches all contained clusters of several hundred eggs but not a survivor—or rather a single representative—made its appearance amongst the sprayed leaves".

The writer of these notes suggested sometime ago that calcium cyanide should be tried against the borer *Pachyteria virescens* Pasc. The Manager of Selborne Estate has recently stated that this treatment was found very efficacious.

Padi.

The liberation of parasites in the Krian area for the control of stem borers has been reduced to 20,000 every 3 days in order to increase the number of eggs of the host, *Sitotroga*, in the laboratory in Kuala Lumpur. A record number of host eggs, 480,000, was obtained on the 26th, June, 1930.

Mr. H. T. Pagden, Assistant Entomologist, who is stationed in the Krian area investigating padi borers, reports several alternative host plants of *Diatraea auricilia* Dudg. including *Hymenachne myuros*, *Sacciolepis myosuroides*, *Setaria rubiginosa* and *Oryza latifolia*. He has found a new parasite of the eggs of *Sesamia* but is of the opinion that it is probably too large to breed in the eggs of *Sitotroga*.

In connection with this work, an extensive programme has been laid down for the next padi season. In addition to the control by the parasite, *Trichogramma nanum*, experiments have been included to confirm field observations that late-sown padi is more heavily attacked than early sown, to ascertain the influence of light in attracting the different moth borers and to obtain information as to the advisability of collecting eggs and destroying padi containing borers.

An insectary is in course of construction for the breeding of *Sitotroga* and of *Trichogramma*.

Spodoptera mauritia Boisd. damaged padi nurseries in Perlis during June.

General.

Important enemies of tea have not been reported and even where this crop has been examined growing under poor conditions, no serious pest was observed.

A sulphur spray for the control of mites on dahlias and chrysanthemums and an emulsion against the lantana bug, *Orthezia insignis* Dougl., damaging roses, colias, violets and other plants were recommended.

Advice was given as to the breeding places and control of house flies on an Estate.

G.H.C.

FROM THE DISTRICTS.

The Weather.

Practically all over the country, except in Lower Perak District and in parts of Negri Sembilan, a period of about two weeks of wet weather with heavy rain was experienced at the beginning, middle or end of the month. There was a very heavy flood at Tanjong Malim on the night of June the 14th and floods are also reported from parts of Negri Sembilan and the Muar District of Johore.

Remarks on Crops.

Rubber.—There was a further fall in the price of rubber during the month. Smoked sheets from small holdings sold for 18 to 21 cents a kati and unsmoked sheet for 16 to 18 cents. Small holders everywhere are feeling the pinch of these low prices. In Province Wellesley a number of small holders have ceased tapping and the number would have been considerably larger had not tappers begged to be retained in view of the increasing unemployment. Many holdings remained untapped in Singapore Island and tapping also ceased on holdings in Selama District of Perak. In Southern Perak some Malay owners are tapping their own holdings, while in Johore on many Chinese holdings wages have been reduced or tappers have been given a half share of the rubber. Deep tapping is common and weeding is neglected. The cultivation of padi and food crops is tending to receive more attention and in several localities Malays are evincing an interest in crops other than rubber.

Reports of the presence of secondary leaf fall disease were received from two estates in Perak, its presence being confirmed in one instance only, and also from two estates, constituting new centres for the disease, in Malacca. On the estate in Perak a nursery of seedlings was heavily infected while a bud wood multiplication nursery adjoining it showed no signs of the disease.

With the advent of wetter weather Mouldy Rot disease has again become more prevalent in nearly all centres. Many small holders now undertake the required control measures on their own initiative, but the majority are still content to do nothing until they have been served with the usual notices by Inspecting Officers of this Department.

Padi.—In Penang and Province Wellesley, except the Southern District, work on the preparation of the land for the coming season's crop has commenced. A start has been made much earlier than was the case last year, chiefly owing to the early rainfall and the lesson learned from the disastrous effect of the drought in December and January on last season's late planted crop. In parts of Northern Perak work has also commenced. The irrigation water

from a full reservoir was turned on in Krian early in the month. Preparation of land and planting of nurseries were in progress in Southern Perak, Selangor, Negri Sembilan and Malacca, the two former States being somewhat in advance of the more southern areas, since in them many of the nurseries were planted, whereas in the latter this operation had been carried out only in a few instances in Malacca. The wetter weather in Pahang enabled transplanting to be effected, though some of the river mukims in Pahang West have not even yet made much progress with planting operations for the new season's crop. Transplanting operations in the river mukims, even where completed, are late this year owing to the dry weather in previous months and the fate of the wet padi crop is in consequence uncertain. As a result, the planting of hill padi is being encouraged in some Districts. In these mukims a considerable quantity of maize and other food crops have been planted and alternative methods of padi cultivation are being employed. In particular, where buffaloes are available, there has been a distinct revival of the method of ploughing and broadcasting peculiar to the river area and locally known as "tenggala." In South Perak also it is expected that an increased area will be planted with hill padi.

Coconuts.—In Malacca the local price of coconuts is $2.50 a hundred and for copra $4.50 to $5 a picul. In Negri Sembilan the local price for nuts is from 5 to 8 cents each. Copra is only made on estates. All nuts from small holdings are sold for eating; the supply is insufficient, and is supplemented by imports of nuts from Malacca.

In Pahang West the two copra kilns in the river mukims have been closed down owing to the low price of the commodity. It has been suggested to Malays of the Temerloh District, where large supplies of nuts are available, that they might with advantage sell some of their produce to Kuala Lipis, Raub and elsewhere where nuts are scarce and prices high and supplies have often to be obtained from Selangor.

Areca Nuts.—Some healthy young areas of this crop are coming into bearing near Pontian Kechil on the west coast of Johore. Fresh planting is reported in the areas now being opened up at the back of the same coastal belt. In Singapore some 70 acres of well drained mangrove land have been planted with areca nut. As a sole crop the plants are growing well, but where interplanted with rubber or coconuts results are less satisfactory. The rubber appears likely to smother the young areca palms and the latter adversely affect the growth of the coconuts. Some Malays in Pahang West are also displaying an interest in this crop and in kapok.

Coffee.—The area planted by Chinese in Batang Padang District is being extended. Coffee is growing well, interplanted with rubber and fruit trees, on an area of 60 acres in Kuantan district, but no topping or pruning has been done. Some further enquiries for suitable land for coffee planting have been made in Johore.

Other Crops.—Some further enquiries regarding land for oil palm cultivation have been received in Johore. Chillies are being increasingly planted by Chinese

in parts of Western Pahang as a catch crop with rubber. The produce is exported to Singapore where it is sold for $5 to $6 a picul. Ginger is also being planted to some extent as a catch crop near Kuala Kurau. Some young areas of patchouli interplanted with pineapples were observed on the west coast of Johore.

Pineapples.—Heavy crops of fruit have been received by the Singapore factories, but the price still remains very low.

Fruits.—All over the country the crop from native fruit trees such as durian, mangosteen, rambutan, pulasan and langsat ripened or commenced to ripen during the month. In Penang, durians were plentiful and in Johore crops varied in different districts from fair to poor; elsewhere crops were light. Rambutans were selling in Penang for 60 cents to $1.20 a hundred, while in Malacca durians fetched from 15 to 20 cents each.

The Malays in Raub District of Pahang are making a genuine endeavour to improve the fruit situation. A sum of $200 has been subscribed and handed to the Agricultural Field Officer for the purchase of suitable stocks of fruit trees from the Government Experimental Plantation, Serdang.

Notes on Demonstration Station and Padi Test Plots.

Kuala Kangsar Demonstration Station.—Sales were 122 ducks eggs and 19 hens eggs. Khaki Campbell ducks were hatched from eggs placed under a local hen. The Rhode Island Red hens and the ducks continue to lay fairly well, but the Light Sussex hens only produced one egg and the one remaining White Wyandotte did not lay.

Seremban Fruit Station.—Greater and Lesser Yams and the maize variety Salisbury White Corn were harvested. A new area of the maize was sown. On the young trees one fruit of Jaffa, 3 fruits of Mediterranean Sweet and two fruits of St. Michael oranges ripened. The fruits were of good flavour and very juicy. Thompson's Improved Navel Orange did not appear to ripen properly, though it turned yellow.

Kuala Lipis Demonstration Station.—The growth of the Soya bean varieties has been rather uneven, E. B. No. 3 being distinctly better than E. B. No. 4. The two varieties of maize and the ground-nuts have only made fair growth due to dry weather in the early stages. One variety of Tapioca, Java No. 7, was completely beaten down by a storm in the middle of the month. Three varieties of Sweet Potato were doing well, but the variety North No. 3 was less successful. Five varieties of banana planted in November 1929 fruited, the sixth variety, Mas, has not yet formed fruit. The grape fruit trees fruited heavily. Of eight cover crops under trial two, Calopogonium and Centrosema, have made good growth, three have made uneven growth and three have failed entirely owing to drought after planting. All the citrus trees received cultivation and pruning and the general upkeep of the Station received attention.

Pekan Demonstration Station.—The cleaning of the wet padi plots was continued and the dry padi plots were disc harrowed. Lining and holing for budded oranges and grape-fruit were completed. Improved varieties of maize, tapioca and sugarcane from the Government Plantation, Serdang were planted. The first crop of English vegetables was mostly lifted. Lettuce and radish were successful, but cabbages were poor.

Pulau Gadong Padi Experiment Station, Malacca.—Cultivation, consisting of first ploughing and harrowing, proceeded throughout the month and most of the nurseries were sown. One block of nurseries was damaged by a flood immediately after sowing and had to be partly resown. Plots for a new padi manurial scheme were marked out and the work of preparing the bunds was proceeding. This scheme will also be carried out at the Titi Serong and Talang Stations.

Bukit Merah Padi Test Plot, Province Wellesley.—The general layout of this new plot has been decided and the work of repairing bunds and putting drains and water-courses in order has proceeded during the month. The work of clearing the land and preparing it for planting has been commenced and nursery beds were also being prepared.

Glugor Padi Test Plot, Penang.—Similar work to that at Bukit Merah has been carried out on the area which is being leased from Glugor Estate. The work of repairing bunds and water courses has been completed and the first clearing of the land has been commenced.

Talang Padi Test Plot, Kuala Kangsar.—Plots were laid out for the new scheme of manurial experiments.

Lenggong Padi Test Plot, Upper Perak.—A site has been provisionally selected and recommendations submitted for planting it during the coming season.

Kuang and Kajang Padi Test Plots, Selangor.—The general layout has been arranged and the land prepared for planting. At Kuang, seedlings will be ready for transplanting early in the coming month.

Jelebu Padi Test Plot.—Preparation of the land for planting has been completed.

Dong Padi Test Plot Raub, Pahang.—The land was being prepared for planting. In field No. 1 where water was plentiful, the usual system of cutting the weeds and hand cultivation of the soil was followed. In field No. 2 where water was not yet available the land was ploughed and harrowed.

Temerloh Padi Test Plot.—Varieties Radin 13 and 7 were transplanted at the end of May. The former made good growth, but of the latter, which was planted in the deepest portion of the plot, it was found necessary to pull out about one third of the seedlings owing to flooding at about the middle of the month. Nurseries of the dwarf strain Serendah were sown on the 8th June and made good growth.

Alor Gajah Padi Test Plot.—The nurseries were prepared and sown with five selected strains of Nachin and 4 selected strains of Siam; local unselected Nachin and Siam padi were sown for planting in the control plots.

Plant Distribution.

Pedigree strains of padi from various Government Experimental Stations were distributed to cultivators for trial in various parts of the country.

As a result of last season's bad crop, there was a shortage of seed in three padi areas in the Krian District; a large quantity of pedigree seed was therefore sold to cultivators at the end of the month.

Other plants distributed have included fruit trees from the Seremban Station; banana suckers from Kuala Lipis Station; and rambutan seedlings in Singapore grown from special seed obtained in Penang. Tomato seed was sent to Rompin and Pulau Manis from Pekan. In addition, small quantities of locally grown planting material were supplied to school gardens.

School Gardens.

A large number of school gardens were inspected in various parts of the country. Frequent visits by Agricultural Field Officers and their Malay staffs are resulting in an improvement in the organisation of the gardens.

Locusts.

The areas near Tampin on which locusts were found, together with adjacent areas, have been kept under continued observation. Flying insects occurred in very small numbers and no egg masses or hoppers were discovered.

Rats.

In Province Wellesley rewards have been paid for 140,252 tails during the month, making a total for the first half year of 586,958 tails. Poison balls given out amounted to 18,850. As the work of cleaning up the padi fields has commenced, large numbers of poison balls have been placed in patches of undergrowth of all kinds adjoining the padi fields in the hope of clearing out rats from these badly infested patches.

In Krian, as a result of steps taken by the Agricultural Field Officer, interest in rat destruction is reviving and the tails recorded amounted to 115,733.

In Negri Sembilan land adjacent to padi fields is being cleared of weeds and undergrowth and trapping of rats has started. In Malacca also, close attention is being given to the removal of similar cover for rats and a fresh stock of traps has been purchased in readiness for the coming season. No damage to nurseries has so far been reported.

DEPARTMENTAL NOTES.

Major Georgi's Visit to New York.

As noted elsewhere in this number, Major Georgi visited New York to confer with jelutong manufacturers. In addition to his enquiries into the jelutong industry, Major Georgi interviewed representatives of the Department of Commerce regarding possible enquiries concerning tropical plant products from the Federated Malay States; he also visited an important steel company regarding the utilization of palm oil in the tinplating industry.

Demonstration to Market Gardeners at the Government Experimental Plantation, Serdang.

On June 4th, thirty-nine Chinese market gardeners from around Serdang attended a demonstration at the Experimental Plantation. The visitors were mainly Keks, who are essentially pig breeders. It was not surprising therefore that the inspection of the stock farm was the most important item on the programme. They were so impressed that they decided jointly to purchase a pure bred boar for breeding purposes.

Much interest was taken in the mechanical side of tea manufacture, exhaustive enquiries being made regarding running costs and upkeep. The method of withering attracted much attention, as did the oven for firing. It is probable that similar contrivances will be erected for joint use in the area over which these people are working.

Leave.

Mr. T. D. Marsh, Assistant Agriculturist, has been granted eight months and three days leave on full pay, with effect from 13th June, 1930, inclusive.

Mr. Marsh will represent the F.M.S. Government at the World's Poultry Congress, London, in July 1930. He will also be in attendance at the Malayan Stand at the International Exhibition, Antwerp, for one month during his leave.

Mr. A. Sharples, Mycologist, has been granted six months and thirteen days leave on full pay, with effect from 27th June, 1930.

Mr. Sharples will represent the S.S. and F.M.S. Governments at the 5th International Botanical Congress at Cambridge in August and the Conference of Fruit Production to be held in London in August. He will also attend the meeting of the Imperial Botanical Conference on 15th August at the Imperial College of Science and Technology, London.

On the termination of Mr. Sharples' leave he will be seconded to the Rubber Research Institute of Malaya as Chief of the Pathological Division.

Mr. W. N. C. Belgrave, Plant Physiologist, has assumed duties of Assistant to the Director of Agriculture in addition to the duties of his appointment, from 28th June, 1930.

MARKET PRICES.

June, 1930.

Rubber.—The price of rubber continued to decline, a new record in low prices being established. The average price in Singapore was 20.55 cents per lb. compared with an average price of 23.36 cents per lb. in May. The lowest price recorded during June was $18\frac{3}{4}$ cents per lb. while the highest price was 23 cents per lb. The average London price of rubber for the month was 6.15 pence, compared with 6.9 pence in May: the highest price quoted was $6\frac{3}{4}$ pence per lb., the lowest $5\frac{7}{8}$ pence per lb.

Copra.—Copra prices dropped heavily. The average prices for the month were $7.94 per picul for F.M. quality and $8.38 per picul for S.D. quality compared with $8.63\frac{1}{2}$ and $9.15 per picul respectively for the previous month.

Gambier.—Prices further declined during the month from $8.38 to $8.04 per picul for Block Gambier, and from $16.10 to $15.31 per picul for Cube Gambier.

Nutmegs.—Lower prices were realised for nutmegs in June. Singapore average prices were for 110 per lb., $28.25 per picul compared with $29.60 in May; 80 per lb., $35.25 per picul compared with $36.20 per picul in May.

Pepper.—Singapore prices for black pepper were $37.37\frac{1}{2}$ per picul compared with $38.20 in May: $51.56 per picul for white pepper compared with $51.42 in May.

Rice.—Singapore average prices in June: Siam $370, Saigon, white $261; Rangoon, white $244—all per coyan. Corresponding prices for May were $370; $269; $249.

Sago.—Singapore average prices for June were as follows:—Pearl, fair $6.19, compared with $6.37\frac{1}{2}$ per picul in May; Flour, $3.32 per picul compared with $3.85 in May.

Tapioca.—Average prices for June in Singapore: Flake, Small, fair $4.10\frac{1}{2}$ per picul; Pearl, fair, $6.19 per picul. May average prices were for Flake $4.81, Pearl $6.95.

The above market prices are based on the daily cabled London quotation and the daily Singapore quotation for Rubber; on the Singapore Chamber of Commerce Market Reports covering the period of May 26th to June 21st, and on other local sources of information.

1 coyan = 40 piculs. 1 picul = $133\frac{1}{3}$ lbs.

The dollar has been fixed at 2 shillings and 4 pence.

MALAYAN RUBBER STATISTICS.

STOCKS OF RUBBER INCLUDING LATEX AND REVERTEX HELD BY DEALERS AND ESTATES OF 100 ACRES AND OVER, THE DECLARED PRODUCTION OF THE SAME ESTATES, IMPORT AND EXPORT FIGURES, AND ESTIMATED FIGURES OF THE PRODUCTION OF ESTATES OF LESS THAN 100 ACRES, FOR THE MONTH OF MAY 1930, IN DRY TONS.

Territory	Stocks at beginning of month			Production by estates of 100 acres and over		Production by estates of less than 100 acres (estimated)		Imports				Exports (including re-exports)				Stocks at end of month		
								during the month		during the year 1930		during the month		during the year 1930				
	Ports	Dealers	Estates of 100 acres and over	during the month	during the year 1930	during the month	during the year 1930	Foreign	From Malay States	Foreign	From Malay States	Foreign	Local	Foreign	Local	Dealers	Estates of 100 acres and over	Ports
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
MALAY STATES																		
Federated Malay States	...	11,059	13,966	1,688	48,428	8,361	47,237	Nil	11	Nil	37	15,200	4,718	79,361	27,888	8,726	6,441	...
Johore	...	1,671	4,918	953	15,066	4,712	20,331	Nil	3	Nil	7	827	5,810	5,082	32,649	2,216	3,404	...
Kedah	...	356	2,124	411	8,055	1,210	6,483	Nil	Nil	2	Nil	678	2,088	3,577	12,381	400	935	...
Perlis	...	14	6	8	42	15	72		Nil	Nil	Nil	Nil	23	Nil	126	10	10	...
Kelantan	...	175	115	231	1,391	374	2,053	1	Nil	18	Nil	53	553	348	3,181	180	110	...
Trengganu* ...	...	...	...	...	...	...	...	Nil	Nil	Nil	Nil	Nil	179	Nil	938	...	...	...
STRAITS SETTLEMENTS																		
Malacca	...	2,291	1,831	186	5,247			Nil	1,892	Nil	6,995	3,704		18,927		2,161	1,063	...
Province Wellesley	...	106	546	43	1,968	†										89	228	...
Dindings	...	101	118	59	427	1,202	15,459	805	2,932	4,300	16,784	5,707	Nil	29,043	Nil	123	102	...
Penang	1,964	5,374	11	9	49											5,086	14	716
Singapore	4,128	33,265	348	74	1,020			9,707	8,533	48,480	53,380	20,811		105,378		32,402	270	3,049

ANALYSIS OF COLONY AND FEDERATED MALAY STATES DEALERS' STOCKS AT END OF MONTH, IN DRY TONS.

Class of Rubber	Federated Malay States	Singapore	Penang	Province Wellesley, Dindings and Malacca	Johore	Gross total
(20)	(21)	(22)	(23)	(24)	(25)	(26)
Smoked sheet ...	6,308	13,463	3,230	1,363	875	25,239
Crepe	677	15,395	976	705	359	18,112
Unsmoked sheet ...	726	3,544	880	305	504	7,452
Scrap and lump ...	1,015				478	
Total all Grades ...	8,726	32,402	5,086	2,373	2,216	50,803

Notes.—1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month; i.e., Column (7) = Columns (13) + (14) + (17) + (18) + (19) — (2) — (3) — (4) — (5) — (9) — (10).

3. Colony Dealers' Stocks are as published in Return I. & E. 6, dated April 10. The ratio of the reduction on wet rubber, taken from Dealers' returns, is 33.4% for Singapore and 26.4% for Penang.

4. Malay States Dealers' Stocks are reduced by the following fixed ratios: Unsmoked sheet, 15%; Wet Sheet, 25%; Scrap, Lump, etc., 40%.

5. Foreign Imports are as published in Return I. & E. 5, dated May 3, reduced to dry weight by the percentages for April in Note 3; (*S.S. Gazette* Notification No. 919/1930).

6. Foreign exports are those of each State and Settlement as published in the Malaya Monthly Trade Return (Appendix II), and are distinct from Ocean-Shipments as published in Return I. & E. 4, dated May 6.

*7. The State of Trengganu has no organisation at present for the collection of returns of stocks and production; the latter can be estimated as approximately equivalent to exports.

8. All statements are brought up to date monthly and any inaccuracies that may be disclosed are corrected in the totals; the latest publication, therefore, is always the most reliable.

†9. This hypothetical figure, based on the formula quoted in Note 2, contains whatever errors exist in the Columns composing it and may therefore be expected to fluctuate from month to month. A truer indication of production will be the monthly average over as long a period, for which figures can be estimated, as possible.

KUALA LUMPUR,
Singapore, June, 19, 1930.

J. I. MILLER, M.C.S.,
Acting Registrar-General of Statistics, S.S. and F.M.S.

SUMMARY OF PADI REPORTS, FEDERATED MALAY STATES AND STRAITS SETTLEMENTS, FOR THE MONTH OF MAY, 1930.

State	Locality	Acreage of Padi Land	Acreage planted current season	Stage of Cultivation	Prospects of Crop	Estimated crop Harvested	Remarks
		Acres	Acres				
Perak	Krian Dist.	53,250	49,770	Harvesting completed		10,845,380 gts.	Average yield 230 gtgs. per acre
(North)	Larut ,,	8,525	8,275	,,		—	,, ,, 120 ,, ,,
	Selama ,,	3,450	3,450	,,		—	,, ,, 250 ,, ,,
	K. Kangsar Dist	13,997	13,807	—		—	**Note. 1.** x. Acreages of padi land of Tejah, Ulu Kinta, Kampar, Tapah, Ulu Bernam and Slim mukims are not known.
	Upper Perak ,,	3,877	3,739	—		—	2. Harvesting of wet padi in Lower Perak should be completed during the coming month. Reliable yield figures of wet padi are not yet available for Tanjong Malim Sub-District.
(South)	9 Mukims.	13,133x	13,718	Harvesting Progress = 12,426 acres	About 12,000 acres, poor crop being damaged by rats and 400 acres fair, but poor water control and late planting.	Total yield on 724 acres of Tejah, Ulu Kinta and Tapah Dist. mukims = **243,158** gantangs.	**3. Areas of Dry Padi**
	Total Perak	96,232	92,759	Harvesting completed = 1,292 acres			Acres. Yield.
							Batang Padang 1932 334,027 gtgs.
							Kinta 1476 241,467 ,,
							Lower Perak 2438 not yet estimated
Selangor	Coast Districts	18,564	—	Nurseries completed = 4,710 acres Harvesting completed = 13,160 acres			**13160 acres.** Fair, but as this padi is only a catch crop with coconuts a fair crop may not exceed 80 gantangs per acre.
	Inland ,,	4,586		Nurseries now being sown			
	Total Selangor	23,150	—				
Negri Sembilan	6 Districts	37,296	not yet planted	Preparing sawah			
Pahang	West			(See Remarks column)	—	—	**Dist. Raub** Sowing nurseries and preparation of nursery beds are in progress. Sowing nurseries are not in accordance with the scheduled dates, but later.
Straits Settlements	Pro. Wellesley	33,228	—				**Dist. Lipis, Temerloh & Bentong:**—Many areas are in transplanting seedlings, wherever water supplies are adequate, remaining still held up owing to shortage of water.
	Penang	4,000	—				Acreage of padi land in P. Wellesley North, South and central revised in 1930. Figure for Penang is not yet revised.
	Singapore	Nil	—	(See Remarks column)			Preliminary ploughing and preparation of nurseries commencing.
	Malacca	35,499	—				Scattered area 300 acres—Nurseries sown.
	Total S.S.	72,727	—				

14th June, 1930.

(Sd.) L. GORDON CARRIE,
Statistician,
Dy. Registrar General of Statistics,
S.S. and F. M. S.

METEOROLOGICAL SUMMARY, MALAYA. MAY, 1930.

Locality	Air Temperature in degrees Fahrenheit							Earth temperature		Rainfall									Bright Sunshine			
	Means of		Mean of A and B	Asolute Extremes				At 1 foot	At 4 feet	Total		Most in a day	Number of days						Total	Daily Mean	Per cent	Length of Day
	A. Max.	B. Min.		Highest Max.	Lowest Min.	Lowest Max.	Highest Min.					Amt.	Precipitation*	Precipitation, 1mm. or more	Thunderstorm	Thunder heard	Fog morning obs.	Gale force 8 or more				
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	ins.							hr.	hr.	%	hr.
Railway Hill, Kuala Lumpur, Selangor ...	91.6	73.1	82.3	96	69	86	75	84.9	85.0	6.10	157.0	3.56	8	7	4	12	5		192.15	6.20	50	12.3
Bukit Jeram, Selangor ...	89.5	73.8	81.7	91	71	86	77	86.7	88.6	6.41	162.8	2.49	9	8	...	12	1		213.70	7.60	62	12.3
Sitiawan, Perak ...	91.5	73.7	82.6	95	69	87	76	84.9	84.5	3.41	86.6	1.52	8	7	11	20	...		217.85	7.03	...	..
Kroh, Perak ...	88.1	70.8	79.5	92	68	83	73	81.9	84.1	8.33	211.6	1.58	14	13	..	7	...		205.70	6.63	...	...
Temerloh, Pahang ...	90.8	73.8	82.3	95	69	83	77	85.5	86.6	7.53	191.3	2.64	11	11	2	23	10		186.25	6.01	49	12.3
Kuala Lipis, Pahang ...	89.6	72.5	81.1	93	69	86	75	84.3	84.1	8.77	222.8	2.56	14	13	11	20	17		191.20	6.17	...	...
Kuala Pahang, Pahang ...	87.9	74.7	81.3	91	71	85	78	85.6	86.7	7.44	189.0	2.43	15	13	11	6	...		225.90	7.29	59	12.3
Cameron's Highlands, Rhododendron Hill, Pahang ...	73.6	60.8	67.2	78	59	70	62	...	...	7.16	181.9	1.40	16	16	5	19	3		183.85	5.93	48	12.3
Cameron's Highlands, Tanah Rata	74.5	56.3	65.4	77	48	70	62	71.3	69.9	6.51	165.4	1.88	18	15	5	19	3		175.85	5.67	46	12.3
Fraser's Hill, Pahang ...	75.2	63.9	69.5	78	62	72	66	72.6	72.8	5.78	146.8	1.58	17	14	8	16	21		176.45	5.69	46	12.3
Mount Faber, Singapore ...	87.2	76.0	81.6	90	71	78	80	82.3	83.1	6.19	157.2	1.19	16	14	4	12	...		197.55	6.37	52	12.2
Butterworth, Province Wellesley	89.7	75.3	82.5	92	73	85	79	87.1	85.8	5.66	143.8	1.65	15	13	...	10	...		233.55	7.53	...	...
Bukit China, Malacca ...	86.0	74.7	80.3	89	71	80	78	84.4	84.9	7.84	199.1	2.00	13	8	3	3	...		218.85	7.06	58	12.2
Kluang, Johore ...	88.9	72.5	80.7	93	70	77	75	82.9	82.9	6.41	162.8	3.54	8	7	1	11	7		183.15	5.91	48	12.2
Bukit Lalang, Mersing, Johore...	88.5	73.1	80.8	93	71	79	75	82.9	82.6	5.27	133.9	1.29	16	14	...	22	1		197.35	6.37	52	12.2
Alor Star, Kedah ...	90.2	75.0	82.6	93	72	85	78	87.7	87.3	9.06	230.1	4.31	11	16	1	12	...		236.40	7.63	...	...
Kota Bharu, Kelantan ...	90.4	74.3	82.2	93	72	87	77	85.4	84.9	7.93	201.5	2.26	11	10	2	15	1		295.90	6.64	...	...
Kuala Trengganu, Trengganu ...	90.1	73.7	81.9	93	71	87	76	85.0	85.7	4.02	102.1	0.91	15	13	...	11	2	2	223.65	7.21	...	...

* Precipitation ·01 inch or more when measurement is in inches ·2mm. or more when measurement is in millimetres.

Compiled from Returns supplied by the Meteorological Branch, Malaya.